AMERICAN MACHINIST

MARCH 4, 1943

ARMAMENT SECTION: Gadsden Feeds the 105's—Page 101

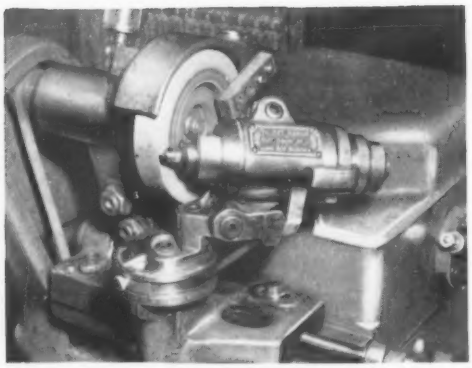
P v 87 pt 2 Mr-Ap '43

TO GET MAXIMUM TOOL LIFE

PLUS PRODUCTION -- ACCURACY -- FINISH

FROM YOUR BORE-MATIC TOOLS

GRIND TOOLS THIS WAY



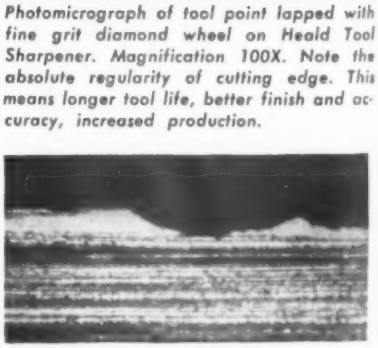
Your single point carbide tools can be quickly lapped exactly to required specifications on the Heald Tool Sharpener — make a few simple adjustments, flick a switch and your tool is correctly lapped, automatically.

NOT THIS WAY

The personal element is bound to be reflected in tools ground free hand. Exact tool shapes are impossible to produce. Undesirable irregularities in the cutting edge cannot be avoided.

Free hand grinding of single-point cemented carbide tools will cut ...rt tool life — and lower production, too. By correctly lapping car...e tools on the Heald Tool Sharpener tool life can be greatly in...sed since a lapped edge is keener, cuts longer, doesn't break down ...fast as a ground edge . . . valuable tool material is conserved ...ause more pieces are produced per sharpening, less material is ... in sharpening . . . better accuracy and finish are obtained as a ...lt of the lapped edge cutting more smoothly, holding its contour ...ger . . . production is boosted because time lost in resharpening ... replacing tools is measurably reduced. Such results cannot be ...ained by grinding tools free hand — they must be mechanically ...ped on a diamond wheel. Only by positively controlled diamond ...ping can absolute regularity of cutting edge and exact nose radii, ...e, shear and clearance angles be consistently reproduced. The ...ald Tool Sharpener is designed to sharpen tools this way — quickly ... inexpensively. Complete details gladly sent on request.

Photomicrograph of tool point lapped with fine grit diamond wheel on Heald Tool Sharpener. Magnification 100X. Note the absolute regularity of cutting edge. This means longer tool life, better finish and accuracy, increased production.



Photomicrograph of tool point ground free hand with fine abrasive wheel. Magnification 100X. Irregularities in cutting edge result in localized stress concentration, then breakdown of the cutting edge and rapid wear.

THE HEALD MACHINE CO. WORCESTER MASS. U. S. A.

Tech

AMERICAN MACHINIST

March 4, 1943

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AMERICAN MACHINIST "PRODUCTION"

Now at an All-Time High

★ ★ ★

• Like most of our readers, we are engaged solely in the business of producing for the war effort. Not the actual production of planes, tanks, guns, shell and other war equipment . . . but the know-how that helps *you* make them faster, better and more efficiently.

We, too, have much the same problems . . . such as shortages of materials and skilled personnel. But we've been battling them, and so far are "ahead of schedule" on our three high-priority obligations to Metal-Working:

1. AVAILABILITY—*American Machinist* is being sent to more subscribers than at any time in the publication's 66-year history.

2. USEFUL EDITORIAL—*American Machinist* editorial content is concentrated on solving immediate war production problems. Features such as Armament Sections and Working of Materials Sections continue to highlight the many pages of essential data found in every issue.

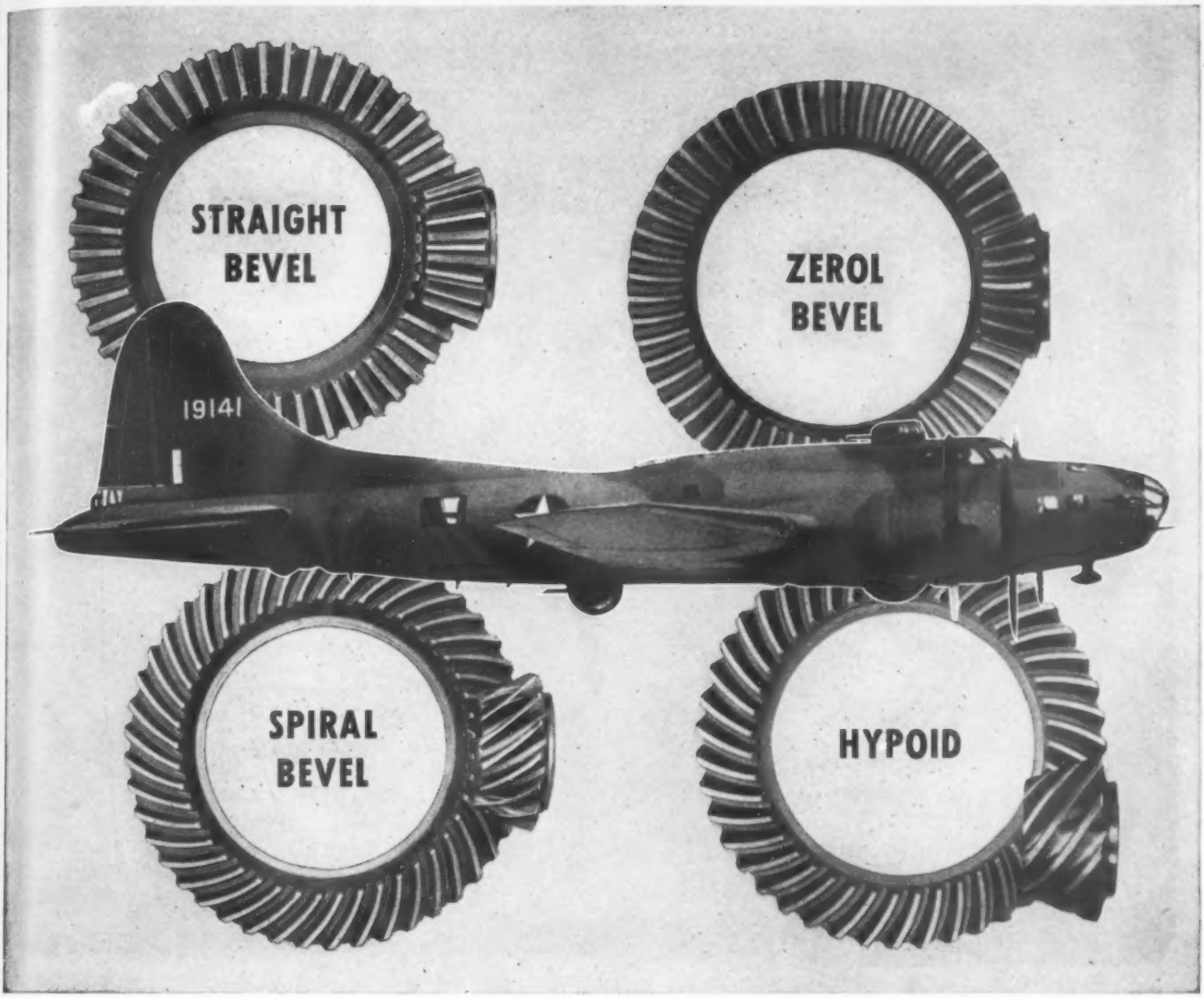
3. HELPFUL ADVERTISING—The manufacturers who serve you are devoting the bulk of their space in *American Machinist* to practical, use-it-today information which represents industrial advertising at its best.

Our Aim for the Duration:

MAKE EVERY PAGE WORK FOR METAL-WORKING

in

AMERICAN MACHINIST



BOMBERS WITH *TEETH!*

In more than one sense of the word do the mighty bombers of the U. S. Air Force have "teeth." Swift, powerful, and deadly, they are a main source of striking power against the Axis.

—But to the Gleason Works the word "teeth" suggests another thought—of the countless bevel gears that make possible this huge striking arm. —From the bombardier's cockpit to the "stinger" turret at the tail, hundreds of bevel gears cut on Gleasons provide reliable, accurate power transmission for essential mechanisms.

Motor gears, automatic propellers, reduction units, landing gear, aileron and rudder controls, instruments—these are but a few of the places where bevel gears are found in today's bombers.

In war plants throughout the country Gleason machines are turning out these gears in ever-increasing quantities. Operating at the highest known standards of accuracy, producing more and finer bevel gears, *Gleasons are literally putting the TEETH in our air forces.*

GLEASON

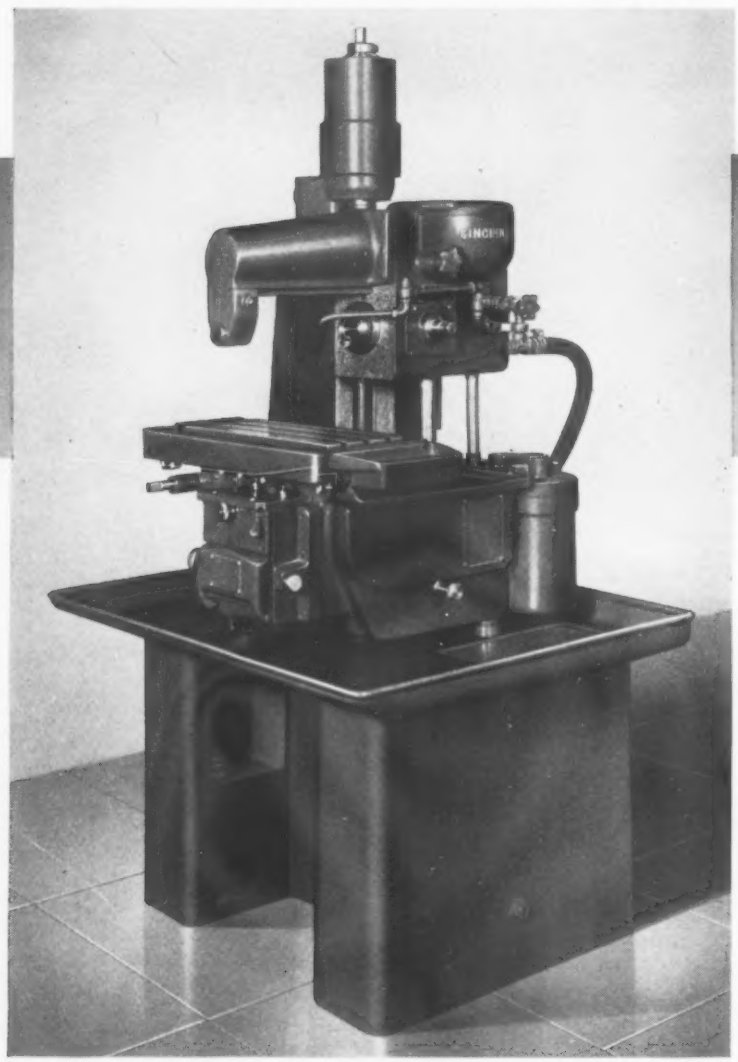
GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER, N. Y., U. S. A.

Master of Small Parts Production... CINCINNATI No. 0-8

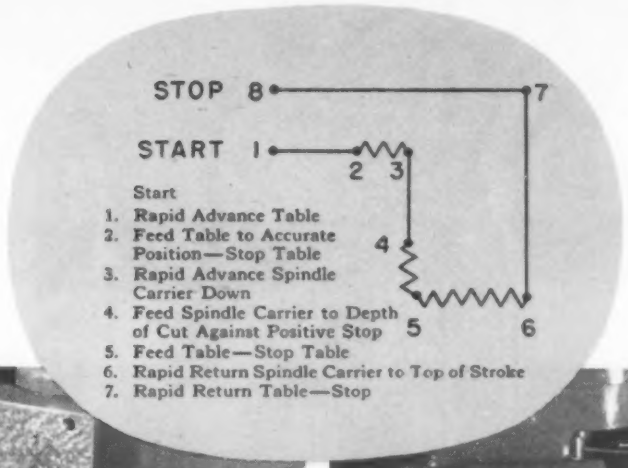
PLAIN AUTOMATIC MILLING MACHINES

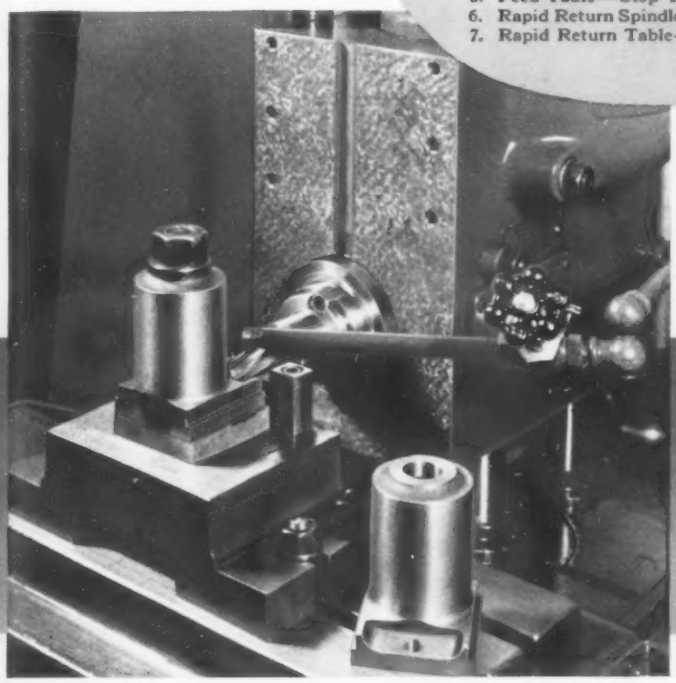


Illustrated at left is the CINCINNATI 0-8 Plain Automatic Milling Machine equipped with Automatic Rise and Fall Spindle Carrier.

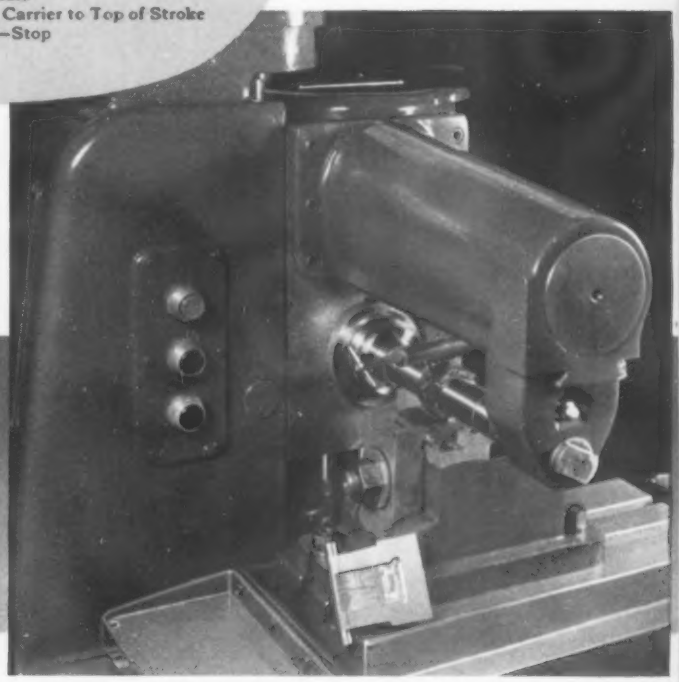
THE CINCINNATI

MILLING MACHINE





Illustrated above, with explanatory cycle diagram (in oval at top) is a typical example of the type of job handled on the CINCINNATI 0-8 Plain Automatic Milling Machine with Automatic Rise and Fall Spindle Carrier.



Milling a groove in a gun locking device — another good example of how the functions of the CINCINNATI 0-8 Plain Automatic Milling Machine, equipped with Automatic Rise and Fall Spindle Carrier, are coordinated.

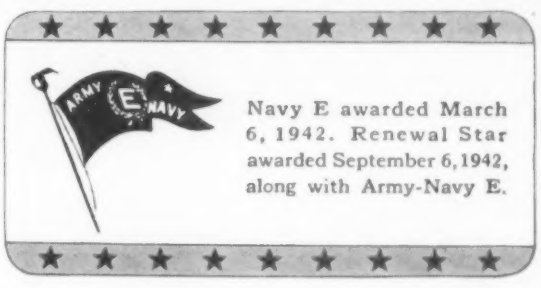
Broken down into component units, the largest tank, plane, truck or gun is composed of countless small parts—parts that are now being milled quickly, accurately and economically, in large or small lots, on CINCINNATI 0-8 Plain Automatic Milling Machines equipped with Automatic Rise and Fall Spindle Carrier.

This versatile miller may be used for horizontal or vertical cuts only, a vertical and then a horizontal cut, two accurately spaced vertical cuts and numerous other combinations. The ability to automatically raise and lower the spindle within exceedingly close tolerances makes the 0-8 especially desirable for jobs where projecting lugs or clamps are in the path of the cutter.

On the 0-8 the entire operation is automatic. Load the fixture, flip the starting lever, and the machine goes through the entire operating cycle automatically, returning and stopping the table at the starting position.

If you are interested in stepping up your small parts production at no sacrifice in accuracy, write for Specification Catalog M-964. This catalog covers details on all features and their benefits. It is another official communique from Milling Headquarters, and is yours for the asking. Send for your copy today.

For a brief description of the 0-8 and other CINCINNATI Milling Machines, look in Sweet's Catalog File.



Navy E awarded March 6, 1942. Renewal Star awarded September 6, 1942, along with Army-Navy E.

T MILLING MACHINE CO. CINCINNATI, OHIO, U. S. A.

BROACHING MACHINES • GRINDING MACHINES • LAPPING MACHINES

GREEN HANDS

AY AUTOMATIC LATHES

AUTOMATIC THREAD GRINDERS

OPTICAL COMPARATORS

AUTOMATIC OPENING DIE HEADS

S BECOME SKILLED HANDS

Courtesy International Business Machines

when Jones & Lamson Optical Comparators are used.

Comparison inspection of production parts with Jones & Lamson Optical Comparators does not require highly skilled operators. Often a few minutes instruction is all that is necessary to enable the least experienced operator to inspect even intricate parts with speed and absolute accuracy.

Jones & Lamson Optical Comparators cover the whole field of inspection by Optical projection and our inspection engineers are ready to study your problems and make recommendations based upon more than twenty years of experience in this field.

JONES & LAMSON
MACHINE COMPANY
Springfield, Vermont, U. S. A.

Manufacturers of: Universal Turret Lathes · Fay Automatic Lathes · Automatic Thread Grinders · Optical Comparators · Automatic Opening Die Heads

SADDLE TYPE
UNIVERSAL TURRET LATHES

PROFIT-PRODUCING
MACHINE TOOLS

RAM TYPE
UNIVERSAL TURRET LATHES

Official U. S. Navy Photograph

WAR PRODUCTION BULLETIN

One of the Gear Shapers "choicest" chores is the cutting of

TORPEDO FUSE AND DRIVE MECHANISM GEARS . . . .

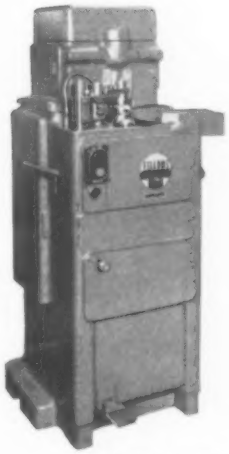
Precision-made, yet in destroying themselves they honor the workmen who made them, and the Navy men who risk their lives in using them.

FELLOWS

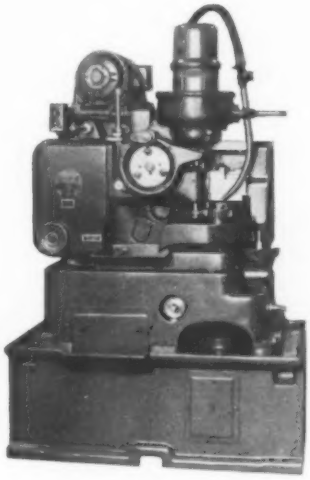
MACHINES AND TOOLS FOR GEAR PRODUCTION

SHAPER CUT GEARS
HELP Blast TOJO'S SHIPS

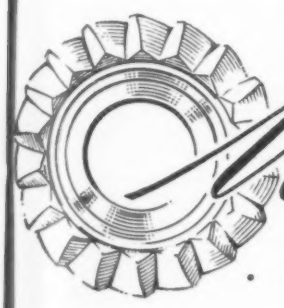
The torpedo's mission is accomplished in a moment's impact on an enemy objective. A ten thousand dollar bundle of destruction, expertly launched from an U. S. plane, ship or submarine, it depends for its unerring accuracy upon the finest of precision in its operating mechanism . . . In this, gears play a vital part, not only in the drive of the high-speed propulsion mechanism, but also as components of the fuse mechanism. For their task of helping blast Tojo's ships, and Schicklegruber's subs, these gears are being cut on Fellows Gear Shapers. We've always been proud of the Gear Shapers' productive capacity, but never more so than when they do their bit to bring the day of victory closer . . . For a complete line-up of Fellows products, ask for a copy of our general catalog, "The Fellows Method", write: The Fellows Gear Shaper Company, Springfield, Vermont —or 616 Fisher Building, Detroit, Michigan, or 640 West Town Office Building, Chicago, Illinois.



3-inch fine pitch Gear Shaper



7-type high-speed Gear Shaper



Method

. . . . FROM BLANK TO FINISHED GEAR

CINCINNATI GRINDERS ENGINEERS

cure many war production headaches • • •

Devising ways and means of solving difficult production problems has become everyday routine here at Grinding Headquarters. Complex as these problems may be, CINCINNATI GRINDER ENGINEERS usually find a satisfactory solution.

If you have a grinding problem, or if there is anything you want to know about precision cylindrical grinding, you are invited to consult CINCINNATI GRINDING ENGINEERS. In addition to untangling knotty grinding problems, these engineers are constantly widening the application and increasing the usefulness of CINCINNATI Grinding Machines. Many unusual and

CINCINNATI Hydraulic Universal Grinding Machines are available in 12-inch, 14-inch, 16-inch and 18-inch swings.

Navy E awarded March 6, 1942. Renewal Star awarded September 6, 1942, along with Army-Navy E.

CINCINNATI

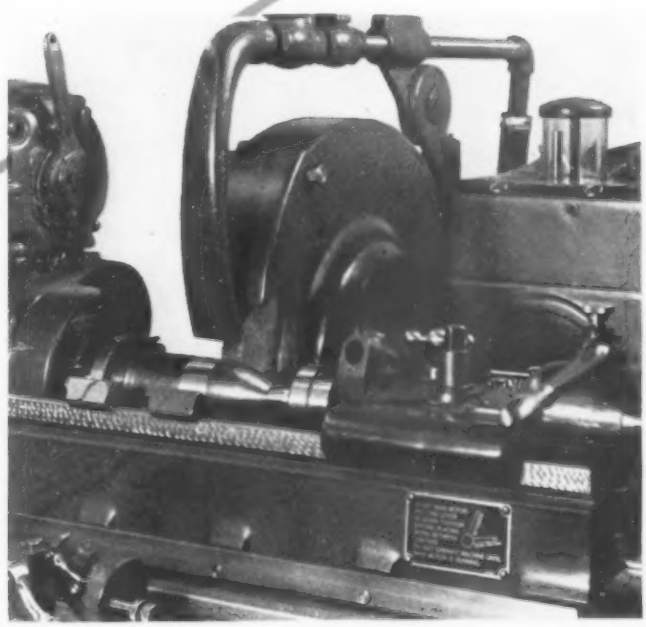
CENTER TYPE GRINDING MACHINES

Grinding Internally and Externally on a CINCINNATI Hydraulic Universal Grinding Machine in one chucking, to assure absolute concentricity.

Noteworthy contributions to precision cylindrical grinding have been credited to this staff of highly trained Field and Factory Engineers.

CINCINNATI Grinding Machines, both Centerless and Centertype, are manufactured in a wide range of types and sizes to meet your toolroom and general manufacturing needs. Specification catalogs giving full details on all features and benefits, are yours for the asking. Tell us the nature of your grinding problem, and we will see that you get complete information. Write today.

For a brief description of all CINCINNATI Grinding Machines, look in Sweet's Catalog File.



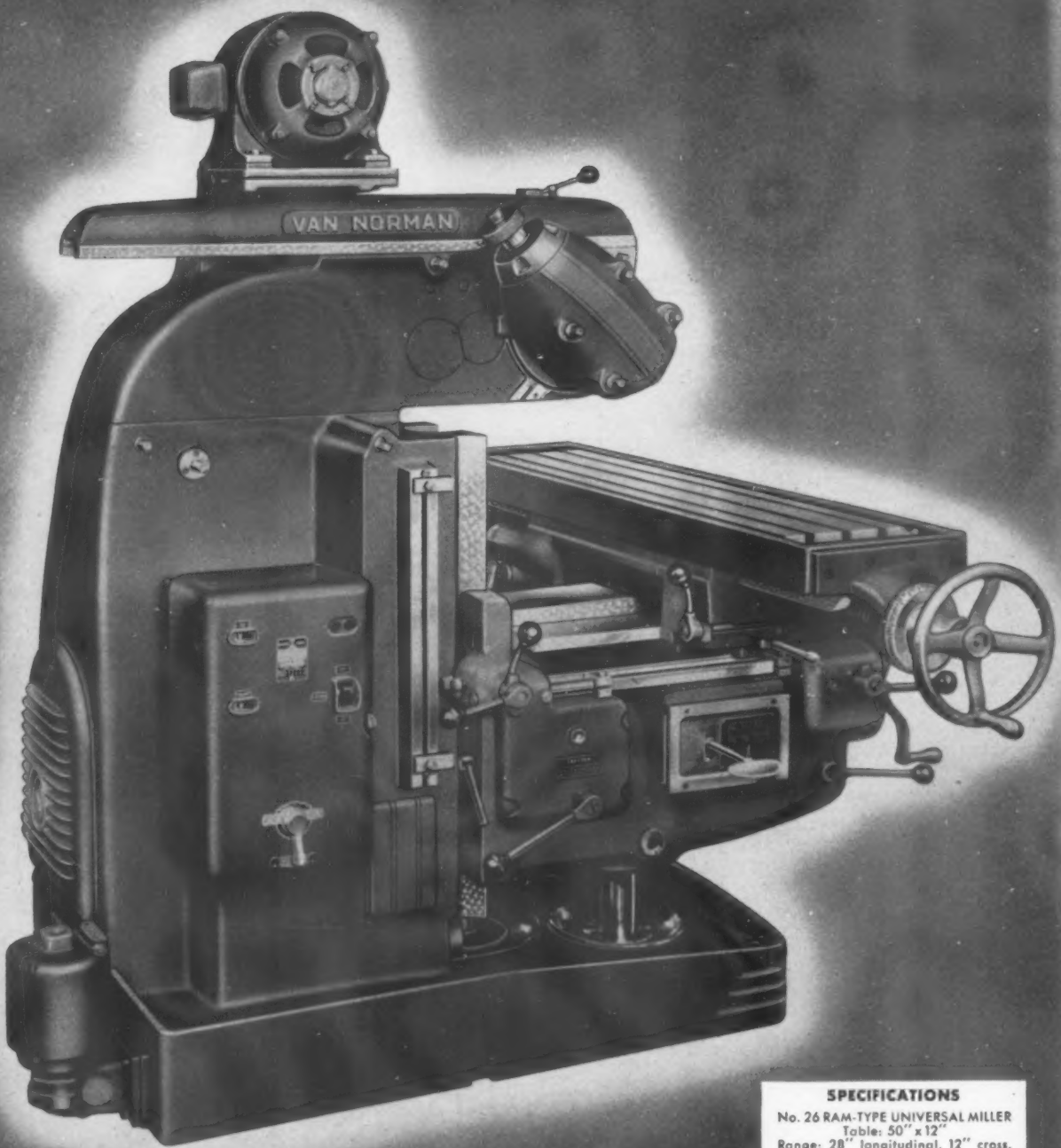
Grinding bourrelet diameter of 75 mm. shell on CINCINNATI Plain Hydraulic equipped with hydraulic footstock and work holding cradles.

TI GRINDERS INCORPORATED

INCINNATI, OHIO, U. S. A.

INES NTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

HORIZONTAL ··· *ANGULAR*

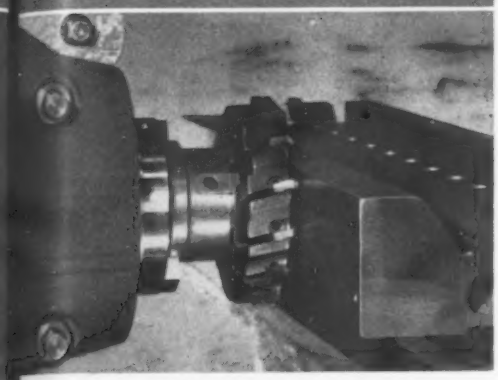


SPECIFICATIONS

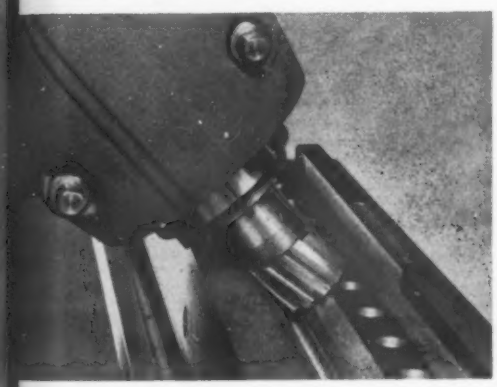
No. 26 RAM-TYPE UNIVERSAL MILLER
Table: 50" x 12"
Range: 28" longitudinal, 12" cross, 18" vertical
18 feeds: 30 to 1500 rpm
18 feeds: $\frac{3}{8}$" to 32"

VERTICAL MILLING

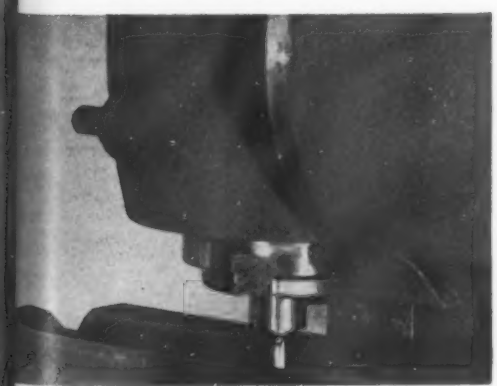
ON VAN NORMAN RAM-TYPE UNIVERSAL MILLING MACHINES



HORIZONTAL MILLING . . . lock the swiveling cutterhead in the horizontal position . . . insert the cutting tool . . . set-up the work and you're ready for the cut.



ANGULAR MILLING . . . swing and clamp the cutterhead at the desired angle and proceed with the operation. No need to change the set-up of the work piece.



VERTICAL MILLING . . . leaving the work still in the original set-up, you set the cutterhead in the vertical position and finish the milling operation. One work set-up enables you to carry most jobs through to completion.

***Minimizes Work Reset-ups**

***Improves Work Accuracy**

***Eliminates the Need of Moving Work from One Machine to Another**

So versatile are the applications of the Van Norman Ram-Type Universal Milling Machine that it fits well into the war production scheme of every plant.

By simply changing the position of the adjustable cutterhead, you can do precision horizontal . . . angular . . . or vertical milling all on this *one* Van Norman machine. Because the work stays fixed in the original set-up, many errors that often creep up when the work piece is changed are eliminated. In addition, valuable men and machine hours are saved because the necessity of transferring the work from one type of milling machine to another is eliminated.

Add to the above advantages . . . simplified directional front and rear controls of all power feeds . . . large, easy-to-read dials . . . solid rigidity . . . accuracy and you'll readily see why an operator with this Van Norman miller can turn out more work faster . . . in a shorter time . . . with less rejects.

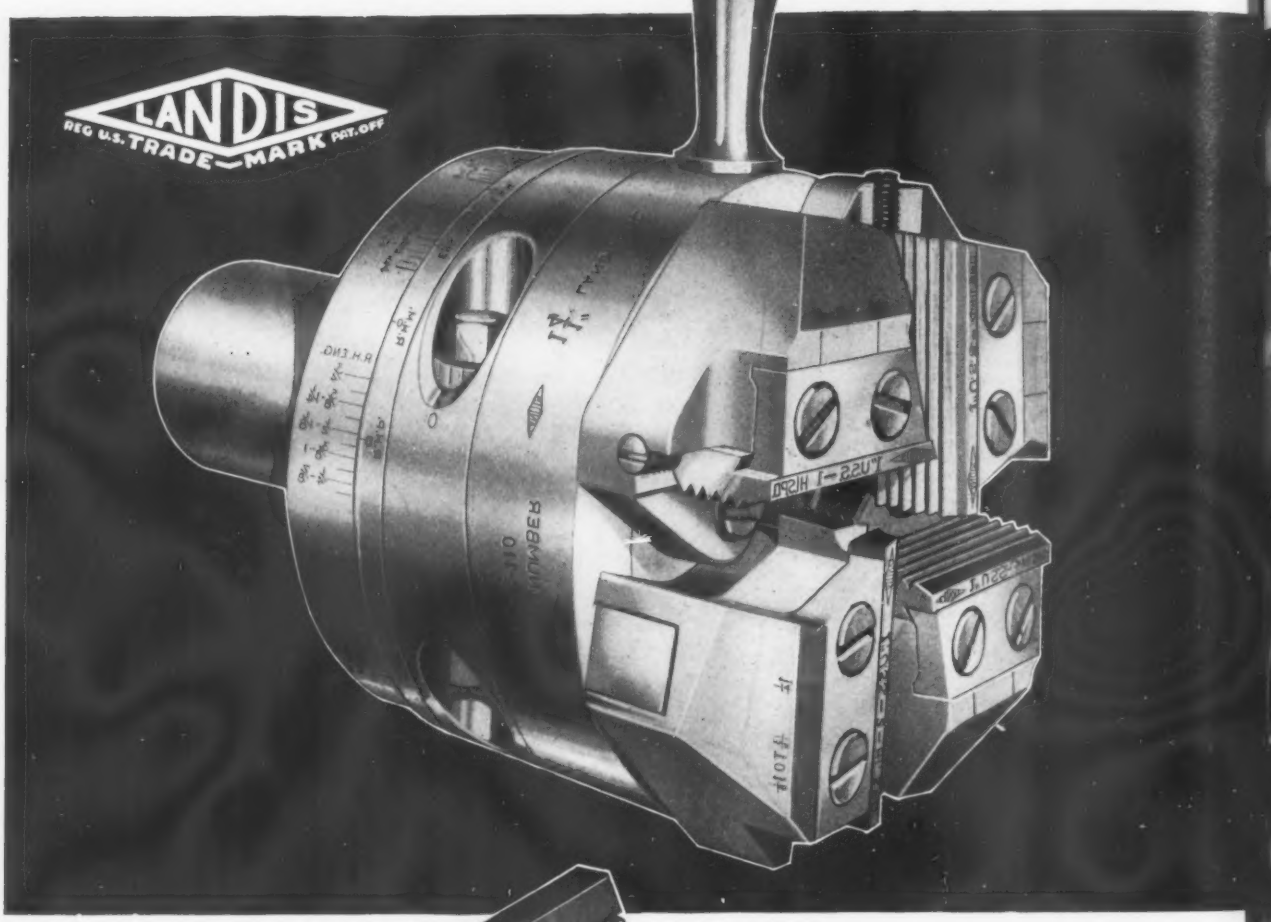
ARMY E NAVY

VAN NORMAN MACHINE TOOL COMPANY

SPRINGFIELD, MASSACHUSETTS

FOR PRECISION THREADING . . .

. . . In the Vital War Plants

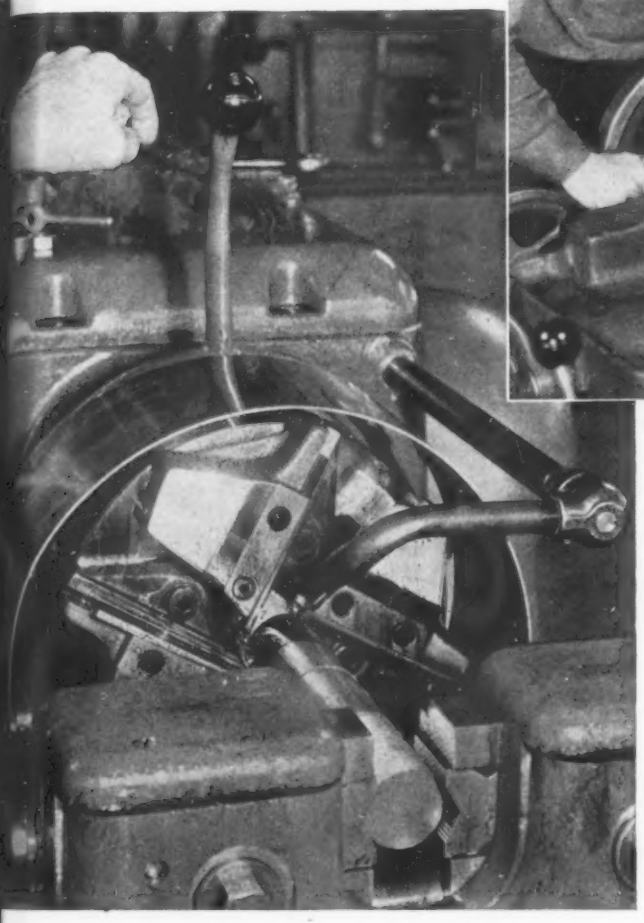


Investigate the LANDIS long-life Tangential Chaser as the means for assuring maximum thread cutting efficiency.

LANDIS

THREADING MACHINERY · THREAD CUTTING DIE HEADS COL

LANDIS



LANDIS TANGENT TYPE CHASERS INCREASE PRODUCTIVITY

with

HIGHER THREADING SPEED
LONGER RUNS BETWEEN GRINDS

One eastern manufacturer increased the production of alloy steel studs more than 100% by employing LANDIS long-life chasers. Twenty-eight linear feet of threads are produced per hour as compared with 12 linear feet by a prior method. Furthermore an average of 15 bars, more than 5 hours' continuous production, are threaded before the chasers require regrinding.

Threads are held to class No. 3 specifications—Cost is reduced to the minimum.

MACHINE CO. WAYNESBORO PENNA. U.S.A.

COLLAPSIBLE TAPS · PIPE THREADING AND CUTTING MACHINES

"AMERICAN"
FOR
ALL-OUT
PRODUCTION

Records Made and Broken Everyday!

"AMERICAN" Hole Wizard Radials are really "goin' to town" on aircraft crank cases. We have reports almost every day from leading airplane engine plants of new records being made and then broken by these "Newest New Radials."

Drilling, reaming, spot facing, boring, tapping—in fact, every kind of work that a Radial Drill will do is handled quickly, easily and at record speed on the "AMERICAN" Hole Wizard.

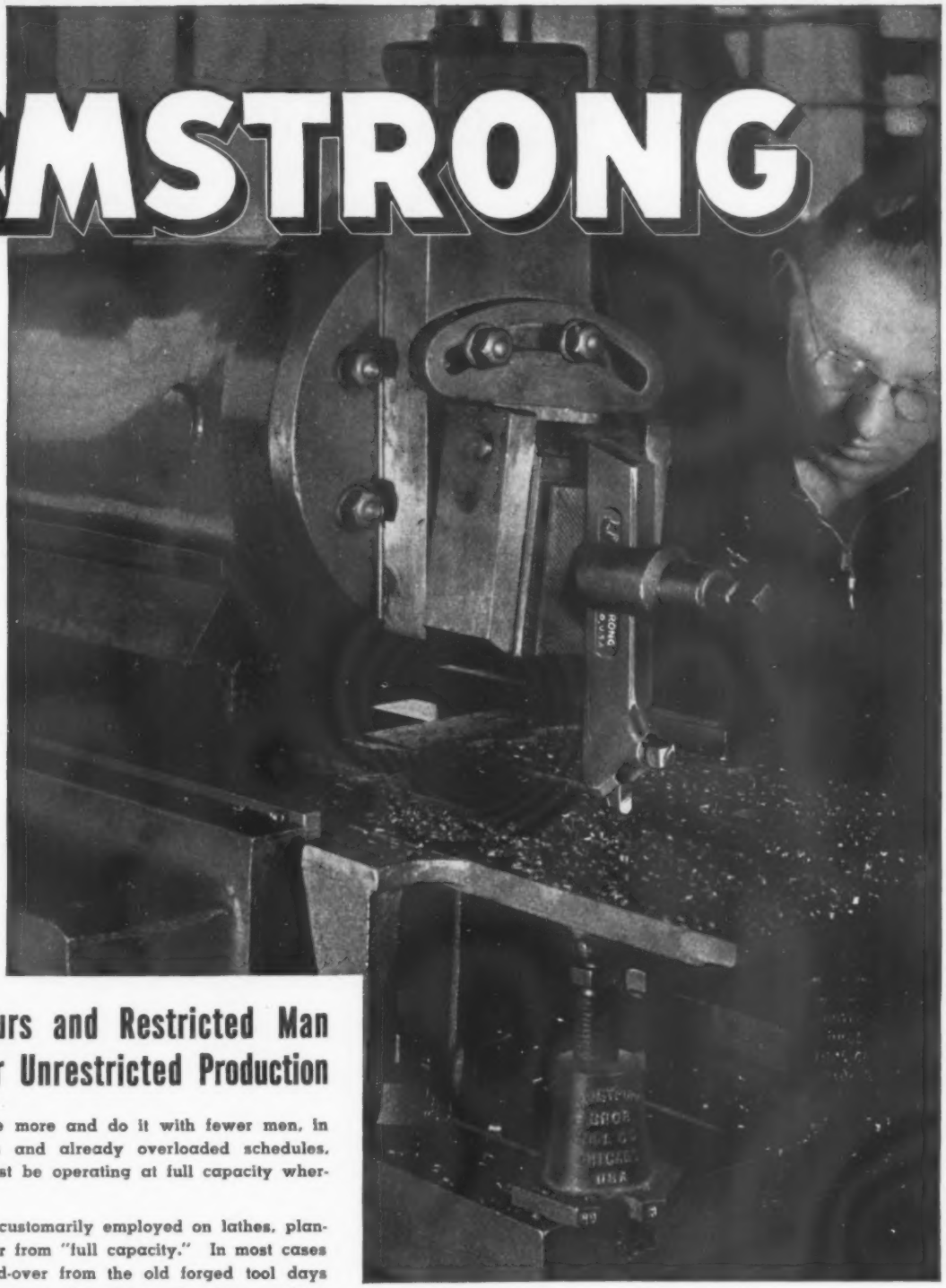
New Bulletin No. 328 tells the story.

THE AMERICAN TOOL WORKS CO.
CINCINNATI, OHIO, U. S. A.

"AMERICAN" *Hole Wizard* RADIALS

LATHES RADIALS SHAPERS

ARMSTRONG



Restricted Hours and Restricted Man Power, call for Unrestricted Production

Since we must produce more and do it with fewer men, in spite of shorter hours and already overloaded schedules, every machine tool must be operating at full capacity wherever possible.

The speeds and feeds customarily employed on lathes, planers and shapers are far from "full capacity." In most cases they have been carried-over from the old forged tool days and are in no way a measure of the limits of modern machine tools that are equipped with ARMSTRONG TOOL HOLDERS. With the correct ARMSTRONG TOOL HOLDERS for each operation it is possible to greatly increase both speeds and feeds without loss of cutting efficiency—*is often possible to even double hourly output by simply shifting a belt or throwing a lever.*

If you have not recently explored the production possiblities of your present equipment, take one of your standard operations performed with any ARMSTRONG TOOL HOLDER and test-out the free cutting speeds above the first vibration point. It may lead to the solution of many of your production problems.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

315 N. FRANCISCO AVE. CHICAGO, U.S.A.

Eastern Warehouse and Sales:
199 Lafayette St., New York

Buy ARMSTRONG tools from your Mill Supply House

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

To Finish The Job Quicker:

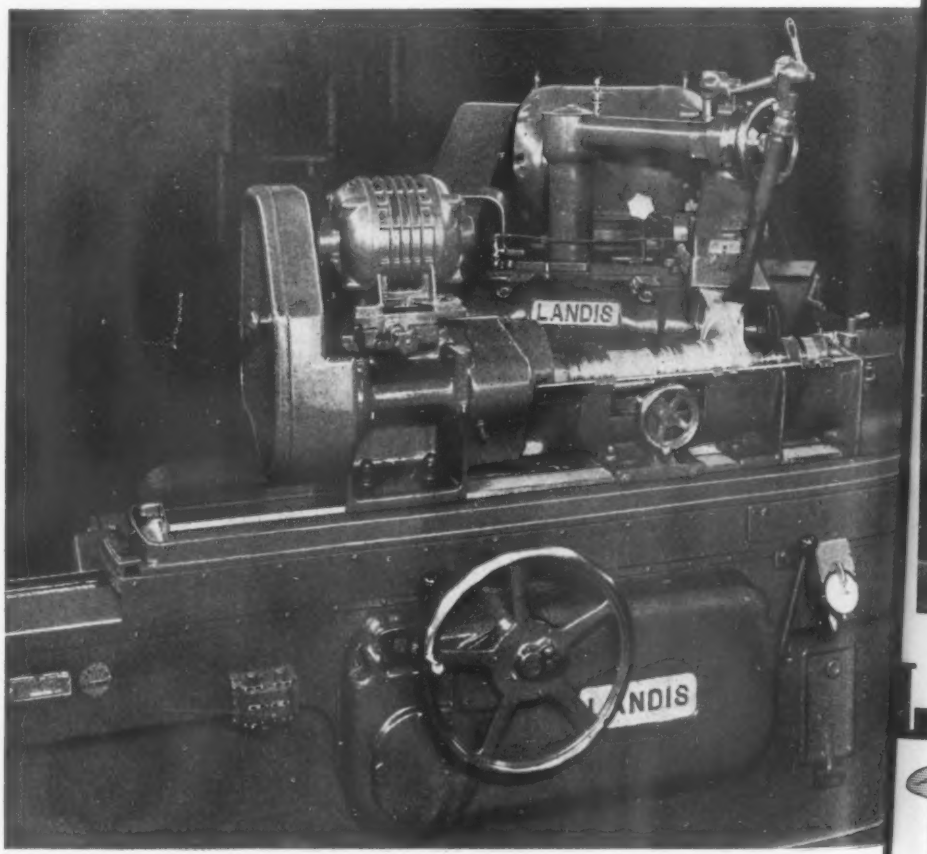
"LANDIS" AIRPLANE PRO

With a roar, the plane lifts into the air and is off. Again we are reminded of the importance of things unseen.

Take, for example, the propeller shaft of that plane which has just soared away so gracefully. Its manufacture was a long careful process, with many grinding operations required. Because of the nature of the part, some of the operations were conventional, while others were unconventional, necessitating the use of numerous elements of special tooling.

Leading propeller manufacturers are aware of all this and they are using Landis Grinders extensively to help solve their many grinding problems. Three of the more unusual operations are pictured and described here. The conventional ones, that is grinding the front and rear plain diameters, are performed on standard Landis 14" x 36" Type C Plain Hydraulics.

As new needs arise or production requirements are stepped up, the long experience of Landis in supplying equipment of this kind is available to those who may have need of it.

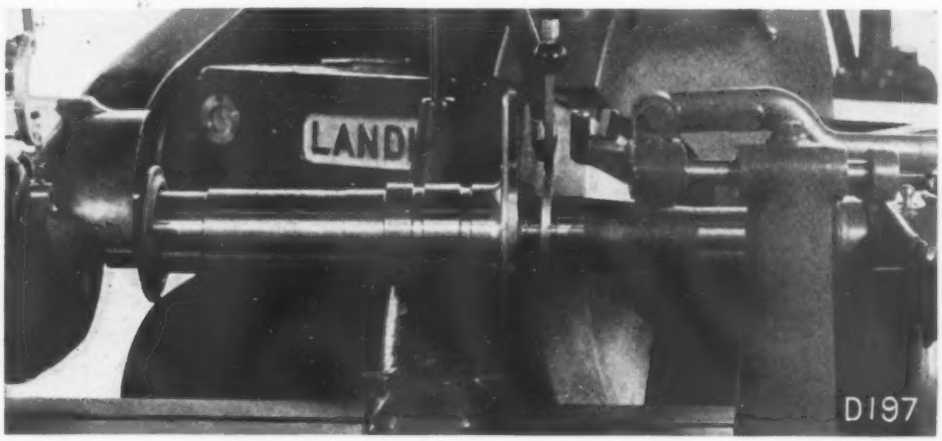


Grinding the front face of the flange on a Landis 14" x 36" Type C Plain with right-hand wheel mounting and wheel base set at an angle. Shaft is turned end for end to grind rear face of flange on same machine.

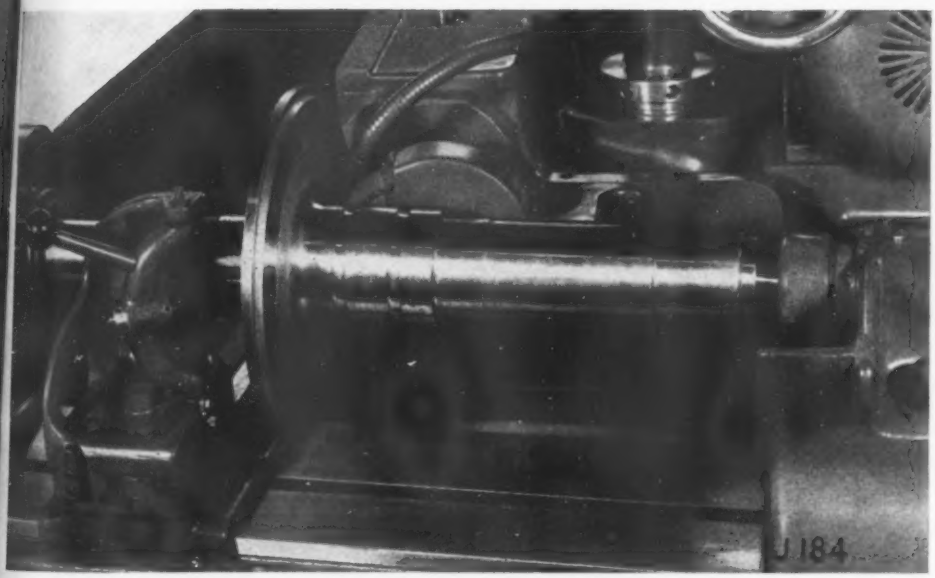
PRECISION LANDIS GRINDERS

Unusual Performance as Usual

S" GRIND YOUR OPELLER SHAFTS



Grinding 1" radius and bearing diameter adjoining radius to blend into relieved face. **Again, wheel base is set at an angle and right-hand wheel mounting is employed.**



Form grinding fillet extending under rear face of flange **on a Landis 14" x 36" Type C Hydraulic Universal. A right-hand wheel mounting and small diameter wheel are used.**

LANDIS TOOL CO. WAYNESBORO, PENNSYLVANIA

LANDIS EXCELLENCE

CONTRIBUTES TO VICTORY

403

THIS SEA-GOING KILLER PACKS A Double Punch!

Streaking through the water at speeds of 60 miles an hour, PT Boats pack more speed and hitting power for their size than any other naval craft afloat. Their capacity to deal death and destruction — like a thunderbolt — makes them one of Uncle Sam's most feared killers of the sea.

★ ★ ★

Double Over-Arms Provide A *Dual Advantage* In Milwaukee Milling Machines

Rigidity and convenience — the Milwaukee double over-arm — scores heavily on both counts.

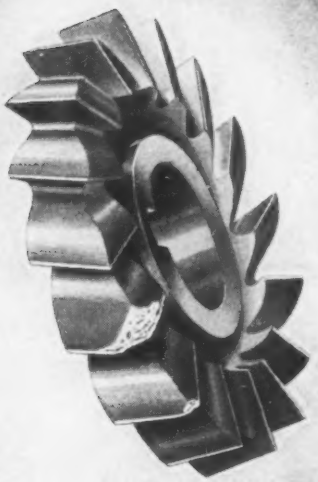
No other means of arbor support is quite the equal of the double over-arm in *rigidity* — an indispensable quality in any milling machine.

No other means of arbor support affords quite the same quick and easy access to the milling cutter — just a few simple motions and both cutter and arbor are free — an important convenience to the operator at all times.

KEARNEY & TRECKER
CORPORATION
MILWAUKEE, WISCONSIN

Buy Victory with at least 10% in War Bonds!

Milwaukee MACHINE TOOLS



"Breaks" LIKE THIS

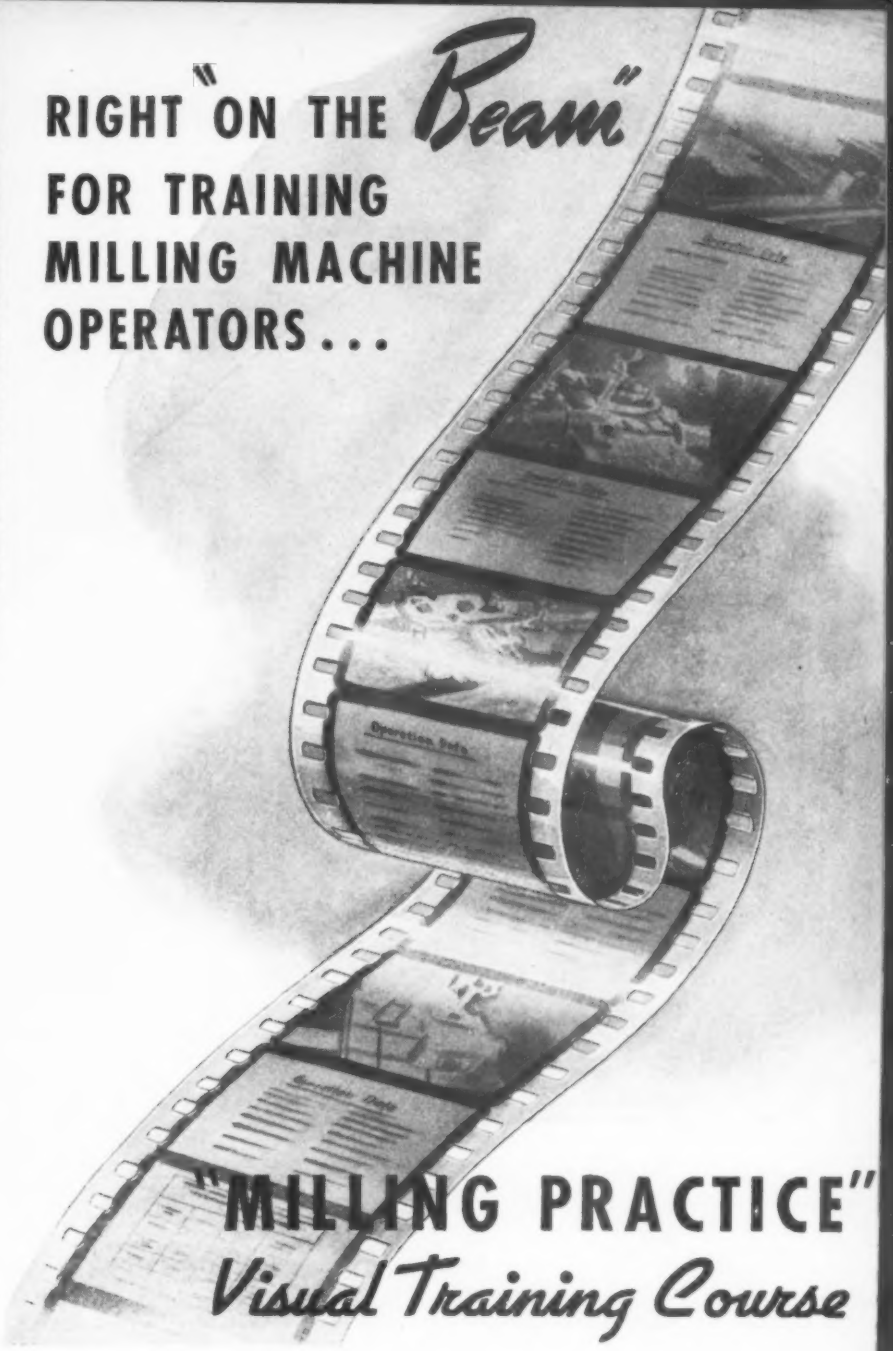
ARE NO "BREAK" FOR PRODUCTION

Broken tools—mechanical troubles — caused by improper care and operation of machine tools, are no help in production for Victory. Practically every machine tool manufacturer offers valuable advisory service — "care and operation" handbooks — technical bulletins — on better methods of operation that help green men as well as speed and improve production of skilled workers.

Put full information in the hands of the men who operate your machine tools — teach them the "know how" to get the most in production with the least waste of time, effort and materials.

Buy Victory with at least 10% in War Bonds!

RIGHT "ON THE Beam" FOR TRAINING MILLING MACHINE OPERATORS . . .



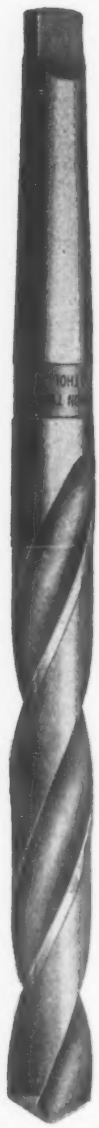
"MILLING PRACTICE" *Visual Training Course*

This Visual Training Program, consisting of five sound-slide films dealing with the fundamentals of milling practice, continues to prove highly popular with technical instructors and industrialists everywhere. Interestingly arranged, the films show many types of operations such as T-slotting, angular and straddle milling, circular milling, dovetailing, boring and end milling.

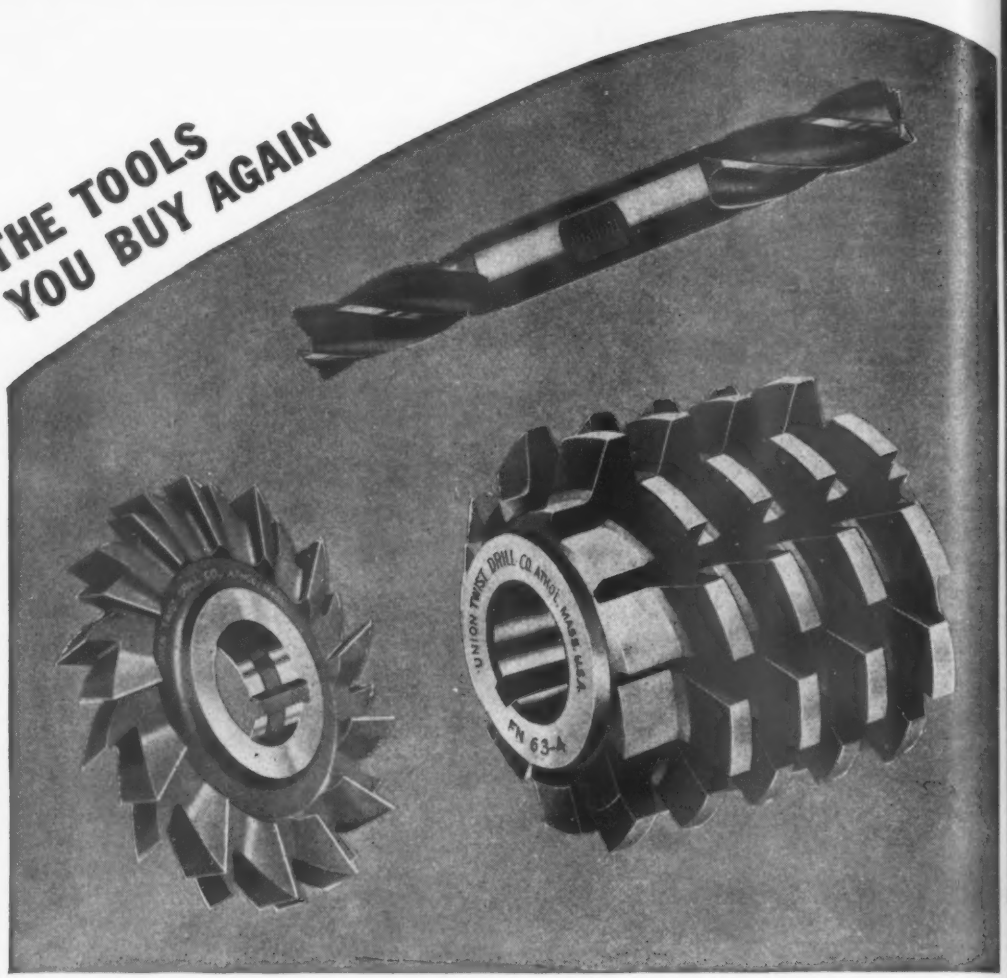
Many shop training directors report unusually successful results with this visual course. It is available on a rental basis at nominal cost. We invite you to write for full information to our Department of Industrial Education.

Kearney & Trecker Products CORPORATION
MILWAUKEE, WISCONSIN
Subsidiary of Kearney & Trecker Corporation

Kearney & Trecker CORPORATION
Milwaukee, Wisconsin



Twist Drills — Milling Cutters — Reamers — Hobs — Slitting Saws —End Mills—Taps— Dies—Screw Plates— Profile Cutters.



SMALL TOOLS FOR BIG SAVINGS

Union's eminent position in the small tool field is the result of the meticulous care taken in the selection of materials, specialized and competent metallurgical experience, modern manufacturing facilities and rigid inspection. Small tools by Union make big savings in cutting time, assure accuracy and more cuts between grinds because every care is taken in every phase of production to realize faster cutting, higher cutting efficiency and more economical results.

You can buy UNION TOOLS on faith—and you'll continue to use them for performance.

UNION TWIST DRILL COMPANY

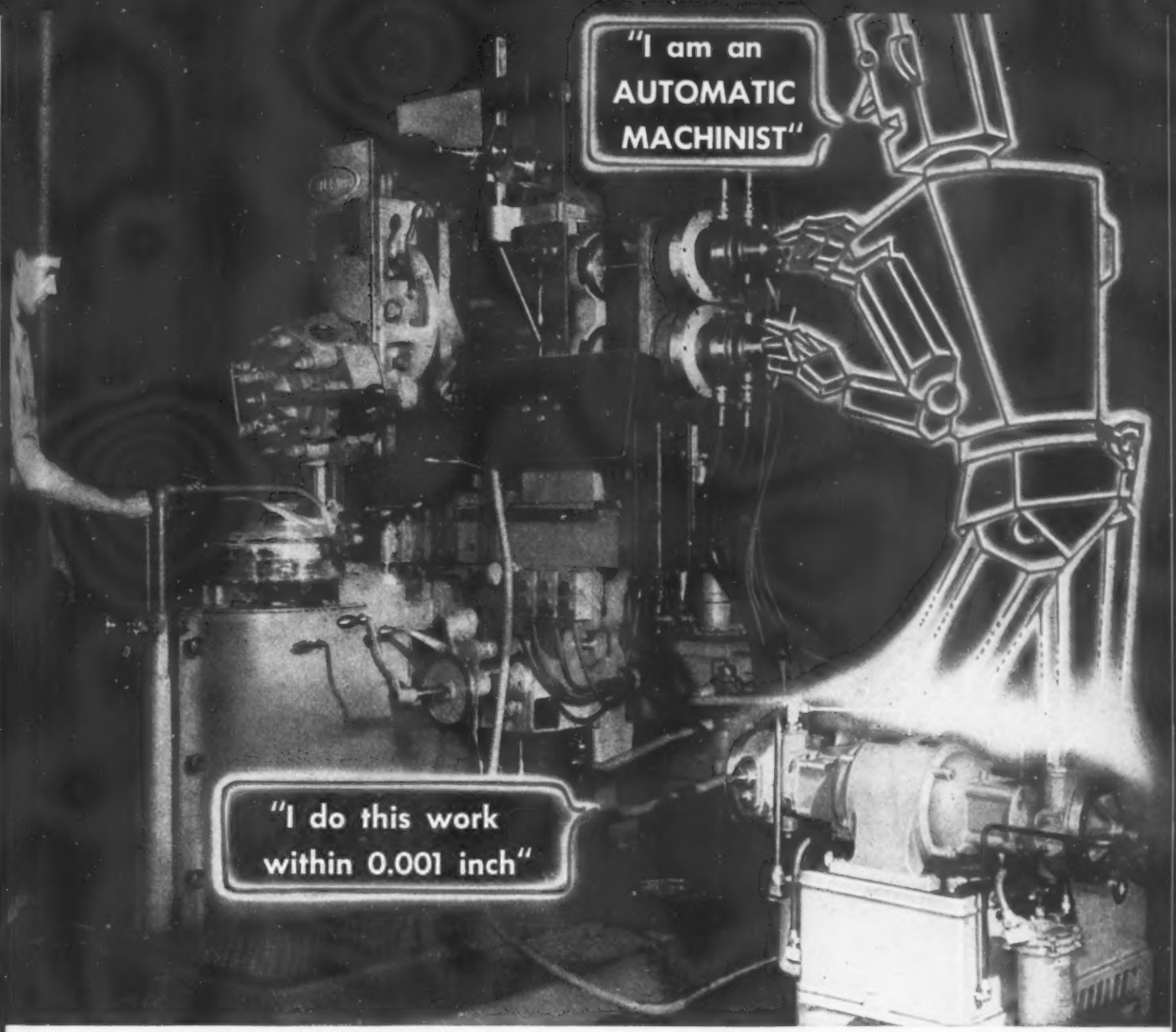
ATHOL, MASS.

STORES New York Store: 61 Reade St.; Los Angeles Store: 524 East Fourth St.; Chicago Store: 11 So. Clinton St.; Seattle Store: 568 First Ave., So.; San Francisco Store: 121 Second St.; Detroit Store: 6540 Antoine St.

MANUFACTURING DIVISIONS
S. W. Card Mfg. Co., Div.; Mansfield, Mass.
Butterfield Division, Derby Line, Vt., and Rock Island, Quebec

Representatives throughout the world

UNION



Get this *AUTOMATIC,* ERROR-PROOF OPERATOR and get 7 TIMES MORE PRODUCTION from *your present standard* tool room tools.

A DUPLIMATIC will automatically turn one, or two, or three feed screws of almost any machine tool, automatically, simultaneously! It will permit almost any standard machine tool to be converted over to mass production contour machining at accuracies that will astonish you.

It is uncannily human, yet it operates with absolute certainty.

No human operator could possibly turn the two feeds on this vertical lathe to form-turn this ordnance part at required speeds of production and at the limits demanded. Yet DUPLIMATIC does it easily, accurately and at speeds that exceed the original specification.

DUPLIMATIC "FITS" ANY MACHINE

DUPLIMATIC Single, Dual or the three dimensional "Special"—can be quickly connected up with any standard tool room tool. A few hours to connect the drive heads to the feed screws; a few more to show the operator how simple DUPLIMATIC is to handle and *mass production at tool room limits has started!* An average of 7 times more production than with manual operation alone is the well-established record of DUPLIMATIC.

WHO USES DUPLIMATIC?

The biggest producers of war goods use DUPLIMATIC: Pontiac, Cadillac, Chevrolet, Chrysler, DeSoto, Pullman and Pressed Steel Car, A. O. Smith—to mention just a few.

When your Pet Machinist gets drafted . . .
draft DUPLIMATIC

Send for complet details NOW!

DUPLIMATIC
and your present tool room tools will do more contour machining faster, more accurately and with less skilled help.

DETROIT UNIVERSAL DUPLICATOR CO.

737 E. Milwaukee Ave. Detroit, Michigan

Six ideas for the V-SHIFT

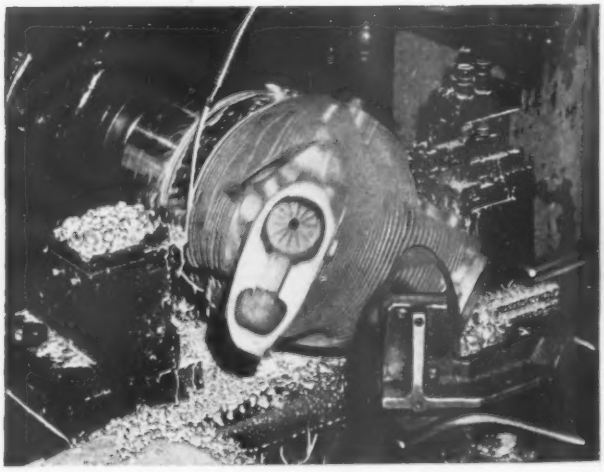
Every one of the six jobs described below took advantage of the versatility of Monarch lathes to increase production or to save waiting for new machines. If you think you can use your lathes to better advantage, perhaps we can help you. Monarch men, here at Sidney or in the field, are always at your service.

THE MONARCH MACHINE TOOL CO.
SIDNEY • • • OHIO

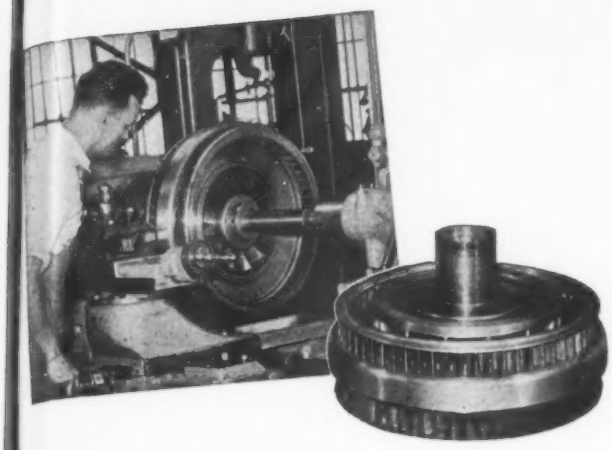
1 This plant uses 22″ Monarch Model M lathes, with automatic sizing, to turn these multiple diameter spindles. One operator can handle two or more machines without excessive effort and without loss of quality production. Here's the way it's done.

1. Support work between centers.
2. Setup—set gage blocks or template and set tool.
3. Turn multiple diameters.
4. Remove work from lathe.

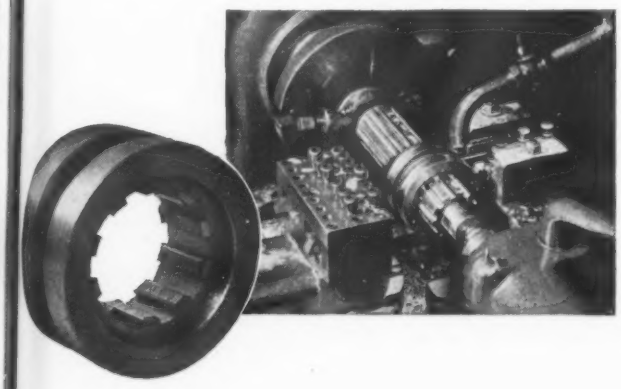
Setup time—12 minutes.
Cutting time—12 minutes per spindle.



2 This job is being done on a Monarch lathe, instead of waiting for another machine tool. It consists of rough-turning, facing and back-facing cylinder head flanges. Work is gripped in an air chuck on a rough surface. Alignment is checked with special fixture in tailstock. Capstan handwheel permits quick movement of fixture to and from work. Tool blocks, on front and rear of cross slide, hold forming and turning tools. Front tools do part of operation, then feed is reversed in apron; slide traversed for rear tool operation, with power feed and working to automatic diameter stop. Only one setup required.



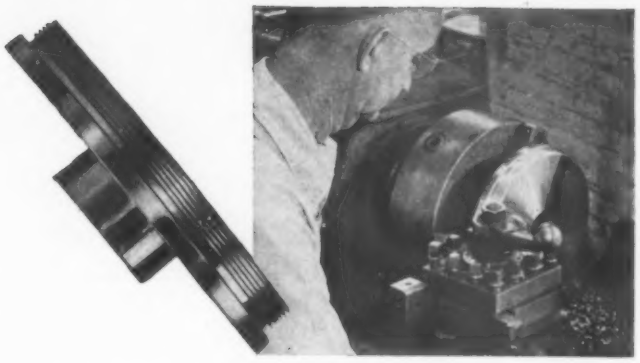
3 Months of time were saved on this job by utilizing a smaller Monarch than apparently was required. A 36″ lathe was indicated, for finishing contour surfaces of aluminum housings. By using to provide a 36½″ swing, a 22″ Monarch does the work, with smaller size Monarch-Keller controls. Careful job analysis saved time, saved $58,000 in first cost, and production is kept on schedule.



4 Finishing of this heavy double-jawed clutch consists of turning OD, forming groove, straddle facing sides, necking groove diameter and chamfering 4 outside corners. It's all done in one setup on a Monarch 18″ Model BB lathe, with double connected rest, tool block in front, and multiple tool block in rear. Here are the steps:

1. Press piece on spline arbor and place between centers in lathe.
2. Turn OD, using tool in rear tool rest.
3. Form groove, allowing for grind. Tool in rear rest.
4. Straddle face sides, and chamfer. Tools in front tool rest.
5. Neck diameter and sides of groove for grind relief.
6. Remove from machine and press off arbor.

Time—8 minutes per piece.



5 Another example of using machines at hand, instead of waiting for new ones. Job is to turn base plugs for bombs. The hub is turned on an older Monarch. Then, they chuck on this hub with a 3-jaw chuck, using square turret with multiple positive carriage stops and clips on cross-feed dial. Now they're ready for these operations, in one setup, on a Monarch 18″ Model BB lathe:

1. Face
2. Countersink hole
3. Turn OD
4. Turn shoulder
5. Neck
6. Chamfer back edge
7. Rough thread
8. Finish thread
9. Chamfer thread

Actual machining time—5 min., 25 sec.

6 This simple method of finishing a gear blank is especially adaptable to long runs, where every second is important. The job is to turn diameter, face side, form hub and radius corners. A Monarch 16″ Model W lathe is used, with air equipment for quick chucking and unloading, a 4-way carriage turret, positive length-stop and micro-gaging dials. One setup does it, in 4.5 min. per piece:

1. Load blank on air-operated arbor.
2. Turn diameter with tool held in turret.
3. Face side, using two tools, front tool facing to arbor, rear tool to form hub being offset correct distance from front tool.
4. Radius corners, using tool with right and left radius.
5. Remove blank from shoulder.

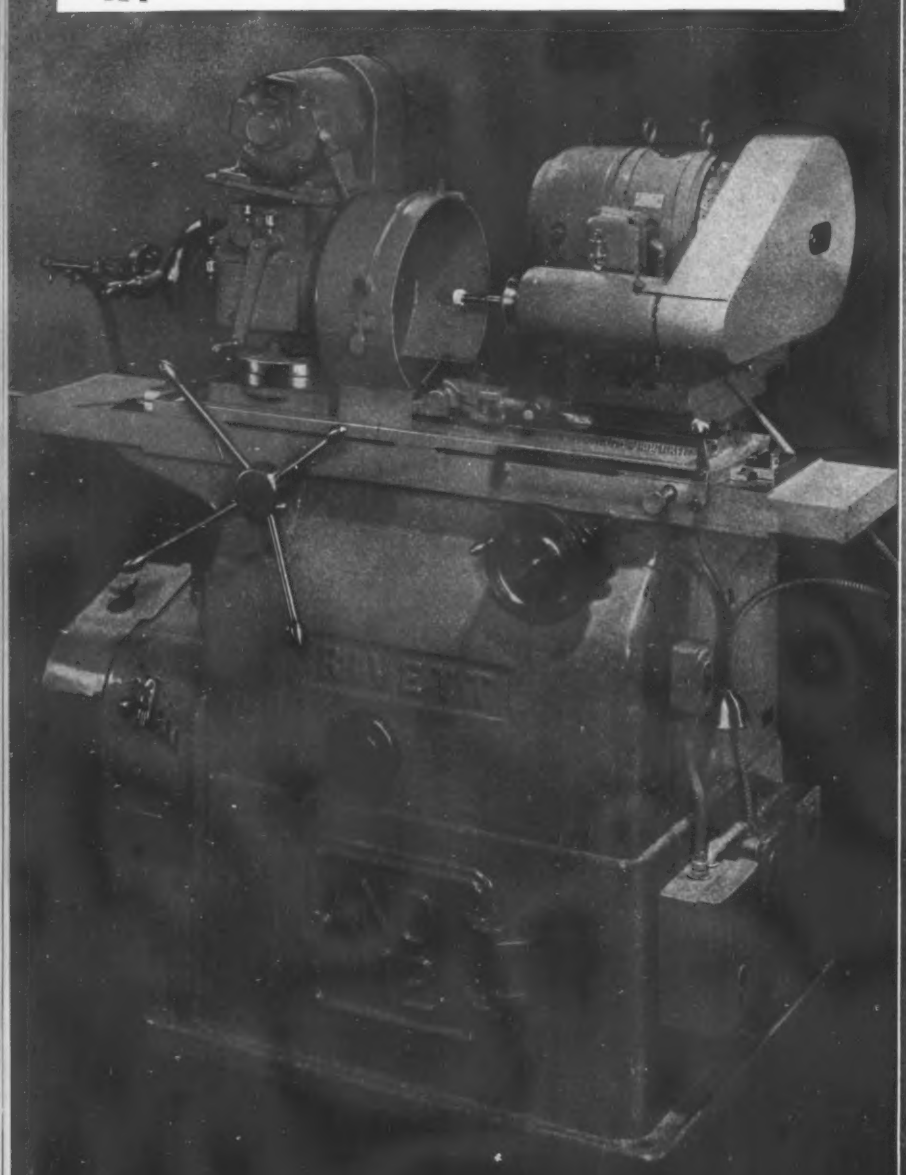
RIVETT

112 UNIVERSAL GRINDER

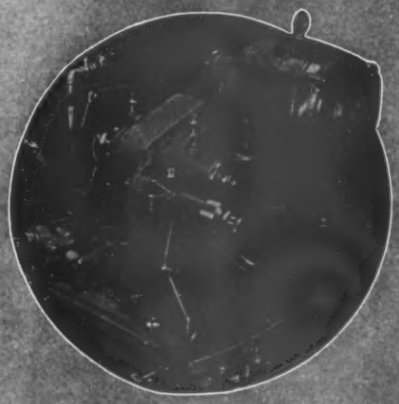
For Straight, Taper, Bevel or Straight and Bevel Grinding

The Rivett No. 112 Universal Precision Grinder is primarily for tool-room work. Available internal and external spindles in combination with many adjustments make possible a great variety of grinding operations. Extreme simplicity of design enables any mechanic familiar with grinding to operate the machine.

Work may be held in collet, step chuck, jaw chuck or fixture and driven at required speed. Power table reciprocation may be set at one of eighteen selective speeds from 10 to 86 passes per minute. Length of table travel is adjustable between ½" and 8". High or low speed internal spindle bracket or external spindle bracket, all as illustrated, may be mounted as required on cross slide. Workhead, table and cross slide are swivelled individually or in combination for taper and bevel grinding.



High Speed Internal Spindle



External Spindle and Tailstock

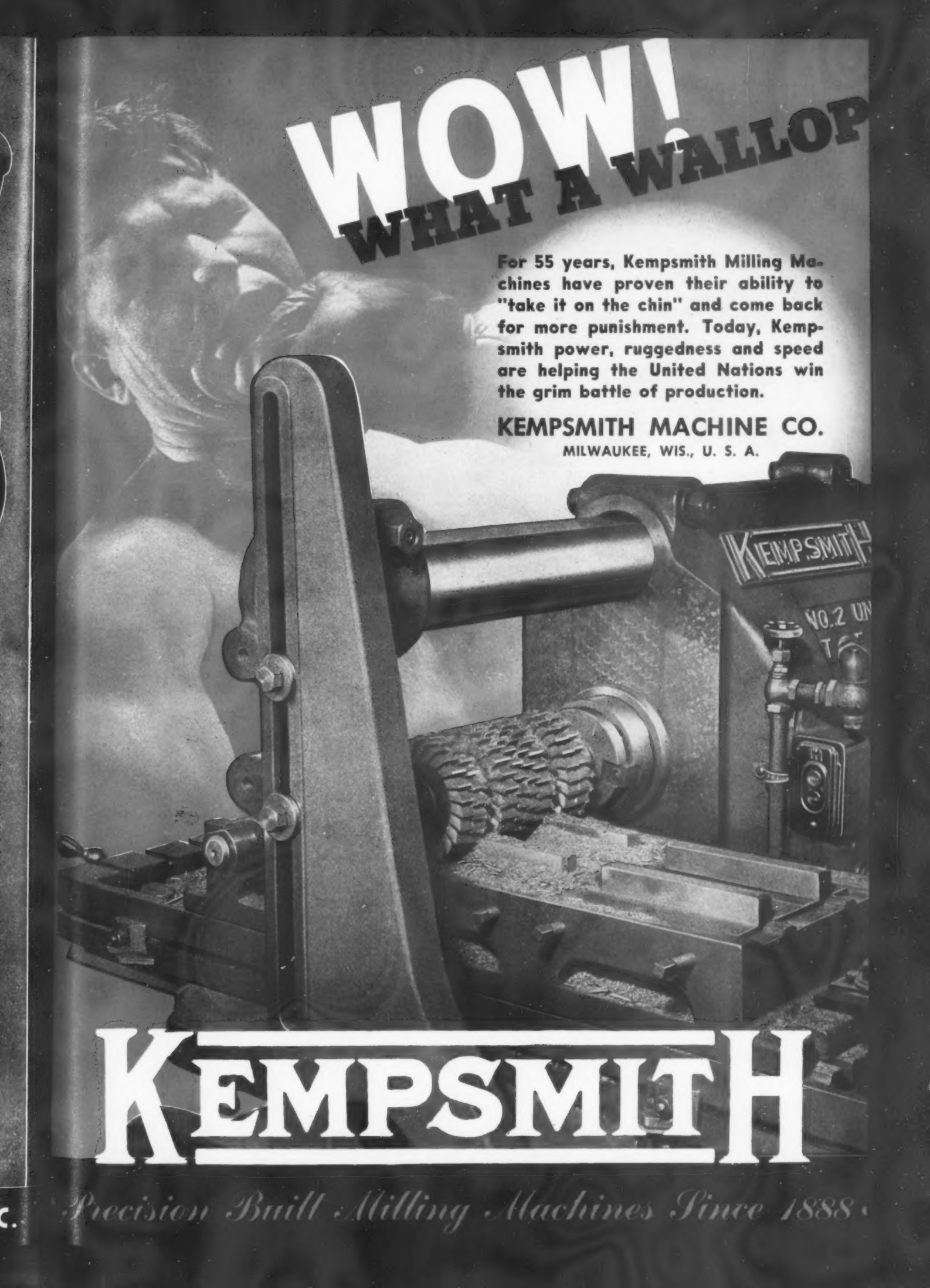
SPECIFICATIONS

Grinding cap., hole dia.	⅛" to 8"
Grinding cap., outside dia.	up to 8"
Automatic table travel	½" to 8"
Table speeds	18 selective
Hand table travel	16"
Swing over table	14"
Workhead swivel	90°
Table swivel	5°
Cross slide swivel	90°
Cross feed graduations	.0005"
Travel of cross slide	3½"
Collet capacity	1"
Step chuck capacity	8"
Jaw chuck capacity	8"
Workhead spindle speeds	150, 380, 600 r.p.m.
Grinding spindle speeds:	
Standard int.	4600 and 10000 r.p.m.
High speed int.	25000 r.p.m.
External	3300 r.p.m.
Automatic Oil Lubrication	
Net weight with motors	3700 lbs.

For Further Description Write for Bulletin 112

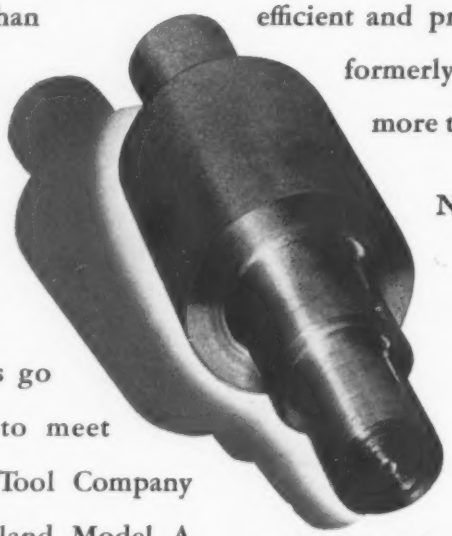
RIVETT LATHE & GRINDER INC.

BRIGHTON BOSTON MASS


WOW!
WHAT A WALLOP
For 55 years, Kempsmith Milling Machines have proven their ability to "take it on the chin" and come back for more punishment. Today, Kempsmith power, ruggedness and speed are helping the United Nations win the grim battle of production.
KEMPSMITH MACHINE CO.
MILWAUKEE, WIS., U. S. A.
KEMPSMITH
KEMPSMITH
Precision Built Milling Machines Since 1888

MICHIGAN TOOL COMPANY STEPS UP PRODUCTION OF CONE-DRIVE PINION BLANKS » » WITH USE OF NEW CLEVELAND *Single Spindle* AUTOMATICS

CONE-DRIVE gears are used where greater load capacity is required than is available from conventional gears of comparable size. Among other advantages, the saving in weight per horsepower transmitted conserves materials.



Great quantities of such gears go into military equipment, and to meet increasing demands Michigan Tool Company production men installed Cleveland Model A Single Spindle Automatics to speed up processing of the cone-drive pinion blanks.

Illustrated is one size of the pinion blanks produced by Michigan Tool Company " . . . at a very satisfactory rate", says a company spokesman. They are formed and cut off from 2⅝-inch round bar stock, reduced in weight from 6½ lbs. to 3 lbs. each in the process. Quantities range from thousands to a few hundred per run. This is the sort of production on which Clevelands are supremely efficient and profitable, completing production formerly done in consecutive stages by more than one machine, with operators.

Nine times out of ten, Clevelands materially increase production, cut costs.

Model A Clevelands are built in 3¾-inch to 8-inch sizes with 4-speed motor drive, variable tool feed and universal camming. In 1 1/16-inch to 2½-inch capacity constant speed drive is standard, 2-speed drive optional at slight extra cost. Bulletins describing the sizes most interesting to you will be sent on your request.

★ ★ ★

Increased production obtained by using CLEVELAND Single Spindle Automatics may release a number of critical machine tools for still more production

THE CLEVELAND AUTOMATIC MACHINE COMPANY

2269 Ashland Road, Cleveland, Ohio

SALES OFFICES

CHICAGO: 20 North Wacker Drive, Civic Opera Bldg., Room 1408
DETROIT: 540 New Center Building
NEWARK: 902 American Insurance Bldg.
CINCINNATI: 1315 American Building

★ ★ ★

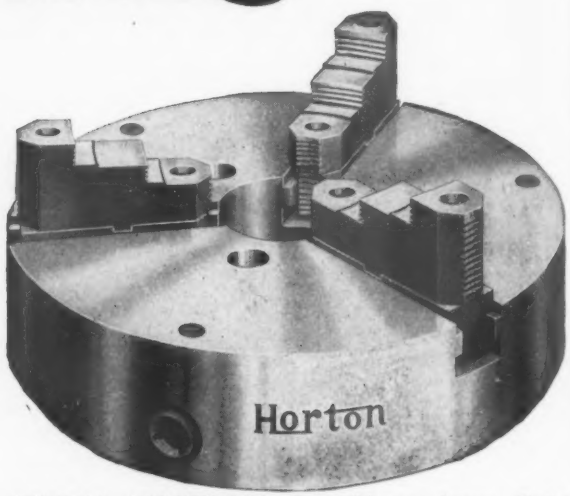
CLEVELAND *Single Spindle* AUTOMATICS

MODEL A—Built in 1 1/16-inch to 9 1/2-inch capacities inclusive

MODEL B—Built in 1 1/16-inch to 2 1/2-inch capacities inclusi

Horton chucks

INDEPENDENT Solid Reversible Jaws Only

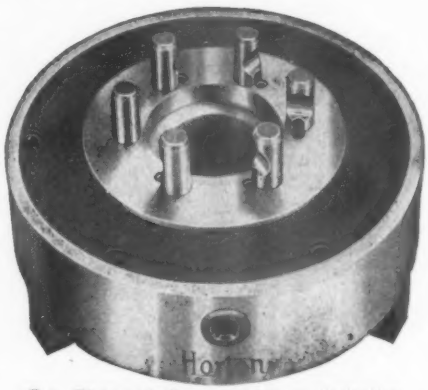


SCROLL UNIVERSAL Two-Piece Jaws Only

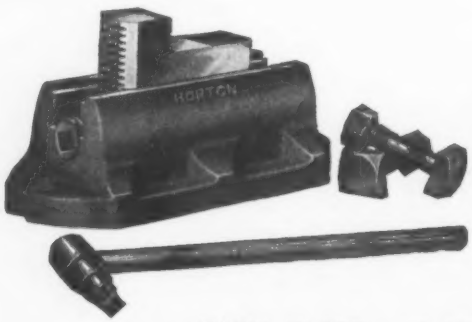
For Use With Intermediate Plates On Threaded Spindles

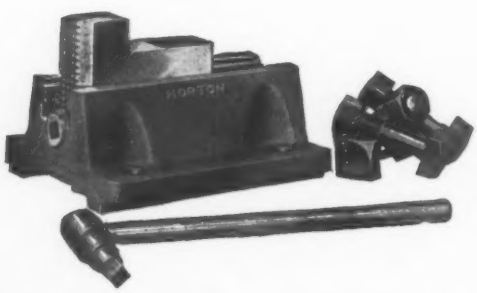
For Key Drive Tapered Nose Spindles

War Production
Limited To These
Essential Chucks



For Flanged Tapered Nose Spindles
Illustration shows chuck for Type D (Cam Lock) Spindle





FACE PLATE and BORING MILL JAWS—Steel Body Only

HORTON
MORROW

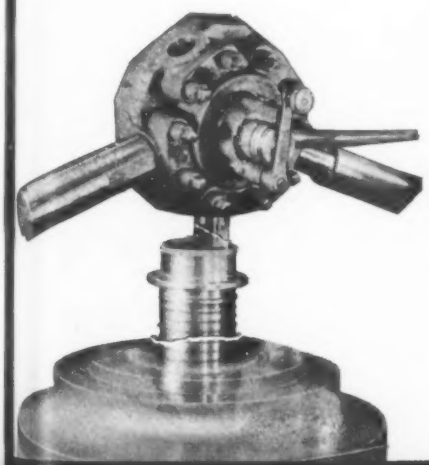
SINCE 1851 .... THE E. HORTON & SON CO.
WINDSOR LOCKS, CONNECTICUT, U. S. A.

Forecast for 1943:

much MORE rain

Is 100,000 planes an impossible figure for 1943? Perhaps . . . but don't be too sure. The aviation industry has scrapped the word "impossible."

For America's makers of planes have now no secrets—from each other. As each discovers a new method to speed production, he passes the news on swiftly to the others. They won't stop short of giving our fighting men *all* the planes they need.



Bullard is proud that the V.T.L. and the Mult-Au-Matic are playing an important part in this unrivalled production. Our wide experience is at your call . . . so that every one of our machines shall produce to its utmost.

THE BULLARD COMPANY

BRIDGEPORT, CONNECTICUT

A NEW FITCHBURG GRINDER

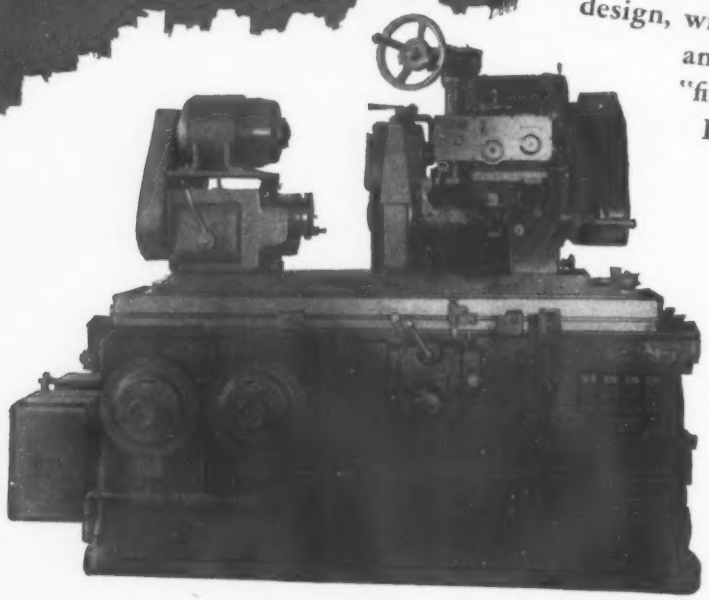
. . . . NEW AUTOMATIC PRECISION "TYPE B" PLAIN CYLINDRICAL GRINDER

Fitchburg announces another new grinder — the Fitchburg "Type B" automatic precision Plain Cylindrical Grinder. Into this new "Type B" are built all the essentials of rigid construction for accurate work and fine finish.

This new Fitchburg "Type B" Grinder is equipped with a Standard Bowgage Wheelhead unit with complete automatic cycle — rapid traverse to work, correct feed, grinding dwell and rapid return. This grinder is of modern design, with all mechanisms readily accessible and ease of operation is assured by "finger tip" controls.

In every detail it fills a definite need for a plain grinder where a machine is wanted for general plain cylindrical grinding, in large or small lots, with assurance of accuracy and fine finish at low cost.

Write today for complete details and information about machines with 10″, 18″, 48″ and 72″ capacity.



NEW FITCHBURG "TYPE B" — 10 inch
PLAIN CYLINDRICAL GRINDER

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U.S.A.

Manufacturers of — Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

HARDINGE

Style "B"

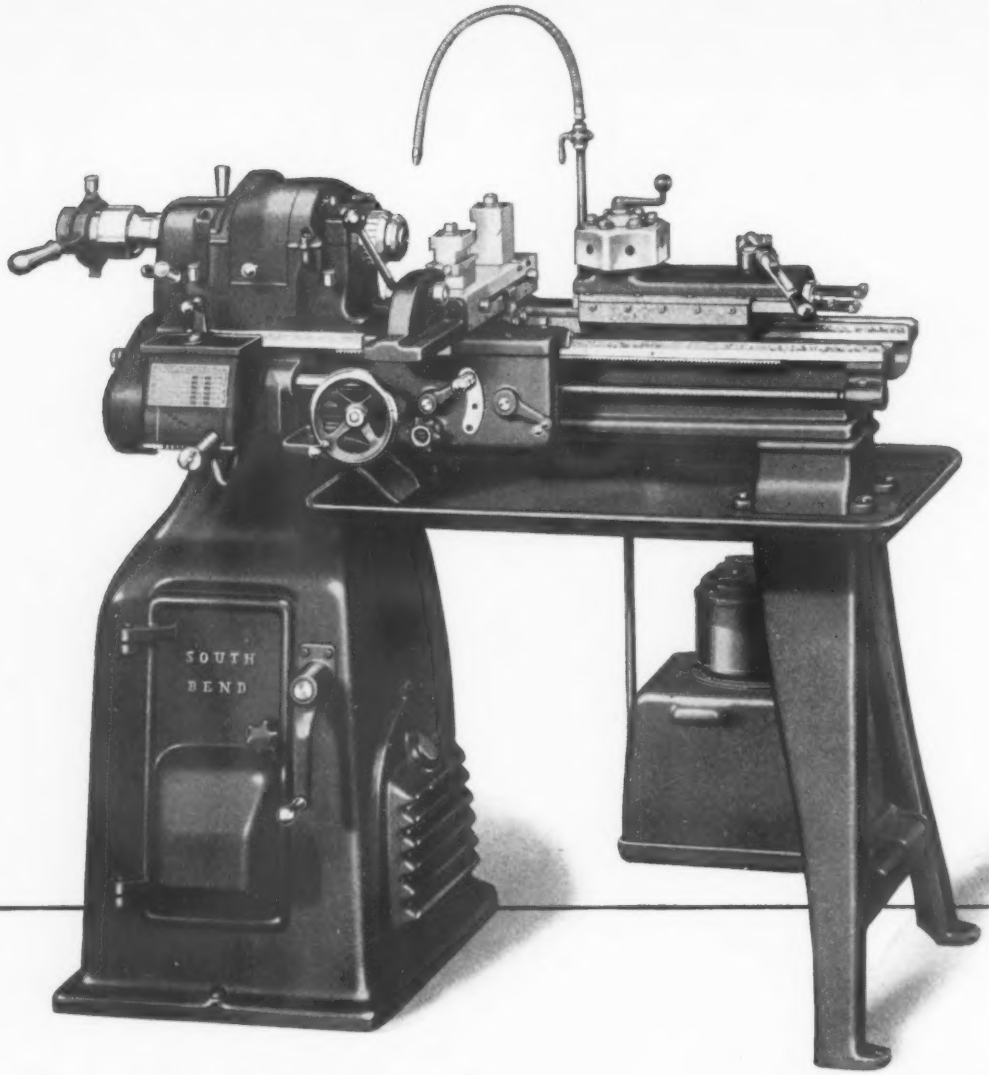
Master Feed Fingers and Replaceable Pads save feed finger users 30 to 80%----

Use the above illustrated master feed finger and pads and save 30 to 80%. The low cost replaceable pads are available in hardened steel, bronze or cast iron. This provides a selection for best wearing qualities and the elimination of marring or scoring of stock. Pads have an integral lug—no pins or screws to cause trouble—an important characteristic. Master feed finger is heat-treated for sustained tension. Available for automatics and turret lathes employing feed fingers with capacity from 5/16 to 1-5/8". Pads interchange between machines with similar capacity.

Learn all the advantages by asking for this illustrated bulletin containing complete information. Available to purchasing agents, superintendents, foremen, engineers, set-up men and operators in organizations which have a screw machine department.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR

HARDINGE
ELMIRA, N.Y.

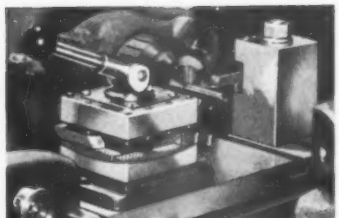


For Rapid Machining
OF SMALL PRECISION PARTS

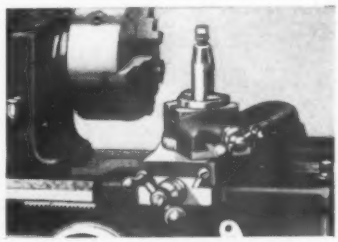
In hundreds of important war production shops the new Series 1000 South Bend Turret Lathes are first choice for machining small precision parts. Highly efficient on all work within their capacity, these lathes are especially popular for close-tolerance, second operation jobs.

SPECIFICATIONS

Hole through spindle	1⅜″	Spindle speeds (12)	50 to 1357 r.p.m.
Collet capacity, round	1″	Thread cutting feeds (48)	4 to 224 per inch
Swing over bed and saddle wings	10⅛″	Universal carriage power feeds—	
Effective feed of turret slide	4″	longitudinal (48)	.0015″ to .0836″
Turret face to spindle, max.	19⅜″	transverse (48)	.0006″ to .0309″



4-Way Turret Tool Block permits greater number of operations per setup. Indexes to 4 positions. Optional equipment.

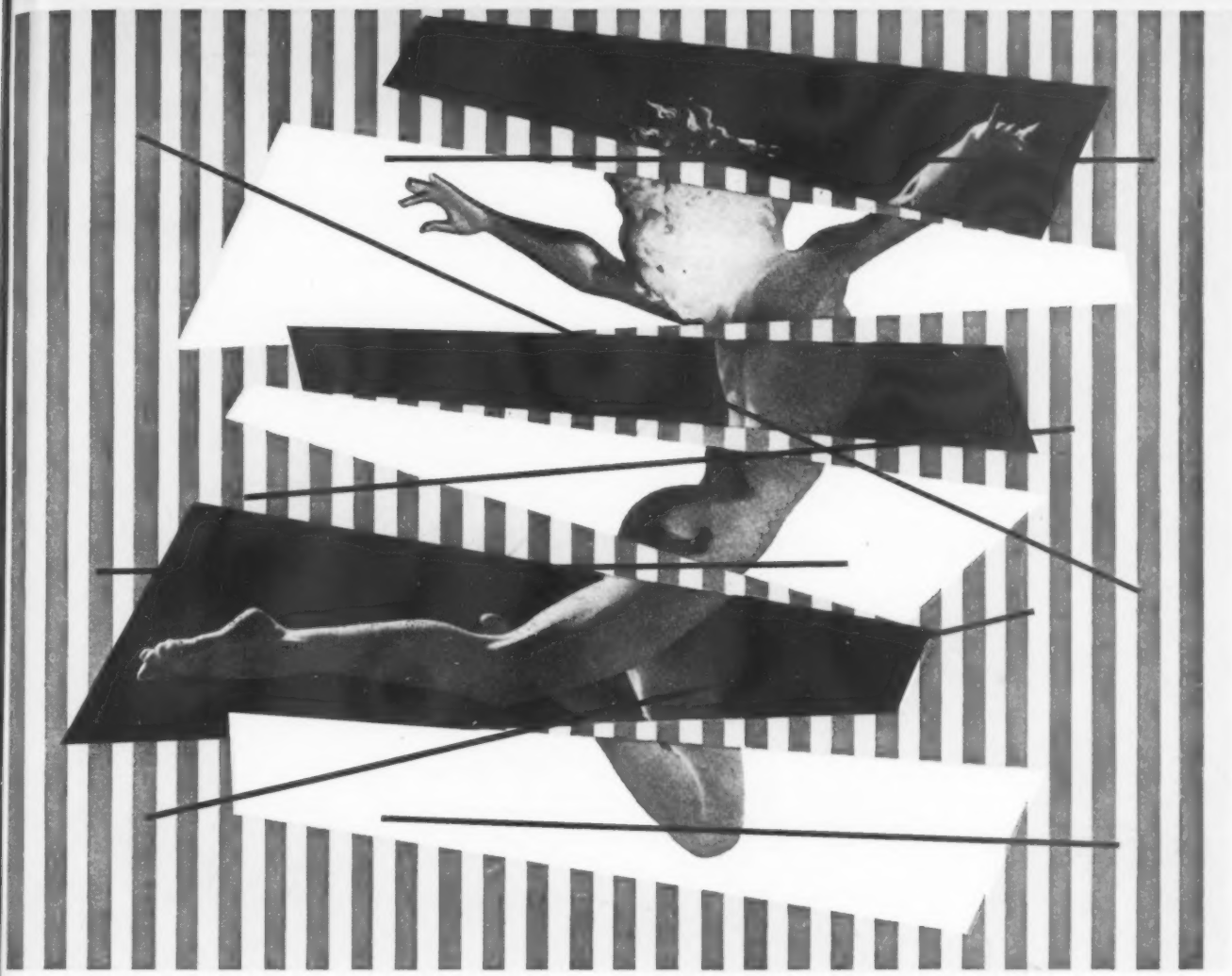


Compound Rest Cross Slide, interchangeable with Handlever Cross Slide, is also supplied as regular equipment.

South Bend Turret Lathes, Engine Lathes and Toolroom Lathes are made in a wide range of sizes and types. Write for catalogs and the name of our nearest dealer.

SOUTH BEND LATHE WORKS

LATHE BUILDERS FOR 36 YEARS — SOUTH BEND, INDIANA, U. S. A.



This machine can be improved!

THE HUMAN BODY, we've all been told, is the most perfect machine ever devised. Poets, doctors and engineers all agree on this point.

Yet even the human body is capable of change and improvement. Take life expectancy, for example. Less than 100 years ago it was 35 years...today, it is 63.3! And our soldiers today are 2 inches taller and 14 lbs. heavier than they were during the last war.

The important thing about these figures is this: No matter how highly developed a machine may be...no matter how miraculous its accomplishments may seem, never make the mistake of assuming it cannot be improved. Mistakes like this have caused the failure of more than one flourishing business!

The machine tool industry is busy today making machines to make the 45,000 parts of bombing planes, 40,000 parts for tanks, and the multiple parts and instruments for ships, cannon, rifles, torpedoes and shells. And as a result of wartime experience, even such highly developed machines as Cone Multiple Spindle Automatic Lathes will surely be improved.

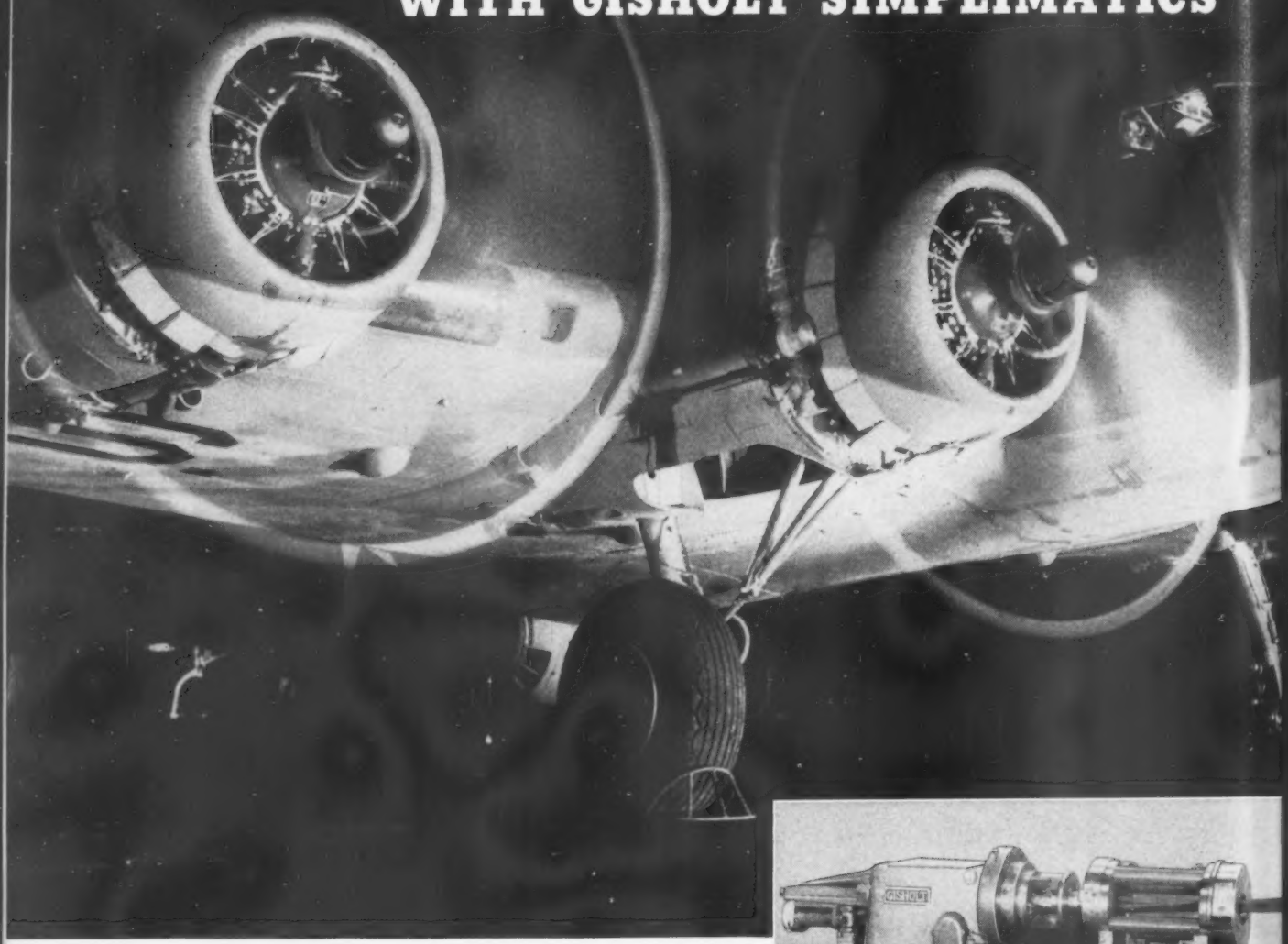
Cone Automatics are now being used to help build instruments of war. But in the peace to come, they will again be dedicated to building a better, brighter world.

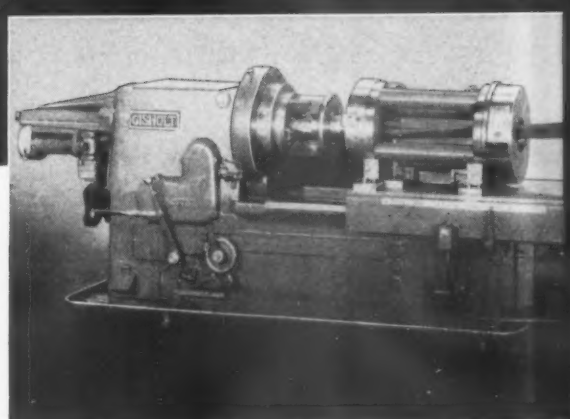
CONE Automatic Machine Company, Inc., Windsor, Vermont

Make it fit to fight!

WE REVVED UP PROP *Production,* TOO!

WITH GISHOLT SIMPLIMATICS





Hub ends of these steel propeller blades are machined both inside and outside by revolving tools on this special Simplimatic set-up, designed by Gisholt. With automatic feeds, speeds, and retraction of tools, very little operator training is required. Complete information on request.

Now, the principle of a stationary work piece machined by revolving tools has been applied by Gisholt to the automatic lathe. The special Simplimatic arrangement shown below is now used to speed up the production of propellers for Uncle Sam's war birds.

The engineering skill to solve all kinds of machining problems in a way that saves time and cost is the reason why leading concerns bring such special problems to Gisholt.

GISHOLT MACHINE COMPANY
1201 Washington Avenue, Madison, Wisconsin

Look Ahead...Keep Ahead...with Gisholt Improvements in Metal Turning

The Army-Navy "E" and the Treasury Flag fly side by side at Gisholt.

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

QUANTITY-QUALITY PARTS PRODUCTION a job successfully handled by

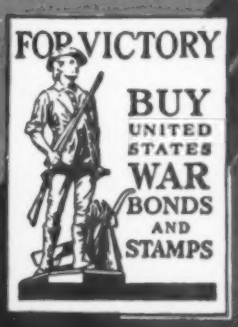
PHOTO BY U. S. ARMY SIGNAL CORPS

P&J *Automatic* CHUCKING EQUIPMENT

Wide flexibility in setup making it possible to perform all roughing and finishing operations in a single cycle is one of the reasons why P&J equipment is able to break production bottlenecks.

This ability to deliver the goods in fast floor-to-floor time is being taken advantage of in the many war production plants where P&J equipment is busy turning out essential parts for weapons of all kinds. Aircraft engines, tanks, guns and adaptors for shells are a few of the essential kinds of equipment that are getting "over there" in greater quantity and in shorter time because of the important contribution to parts production being made on P&J equipment.

P&J began to prepare for today's needs more than forty years ago when it pioneered the development of automatic chucking machines.



TURNING OUT MORE PARTS HERE WILL TURN THE TIDE "OVER THERE"

Buy More **WAR BONDS**

POTTER & JOHNSTON MACHINE CO.,
Pawtucket, R. I.

the SPLIT-SECOND OF PUSHOVER

"The hourglass of peace has given way to the stop watch of war. Not one pound of material, one ounce of energy, one split-second of time is to be wasted. The Future is Now." • With these words, many months ago, General Machinery Corporation swore itself in to war duty. • Back of that order of the day was the know-how and the go-through learned in fighting through five of our nation's wars and in serving through several decades of its peace. We know both. We work in both. We build the machinery on which are made, as our country needs them, swords or ploughshares. • We know that back of the great feats such as winning a war must be great feats of doing—and timing. Of being ready Now for When. • The doing must be done by all of us soldiers, the timing by the general staff who best know When. • The knockout, we know from our fighting experience, must be timed to the split-second of pushover. And you'll find us ready.

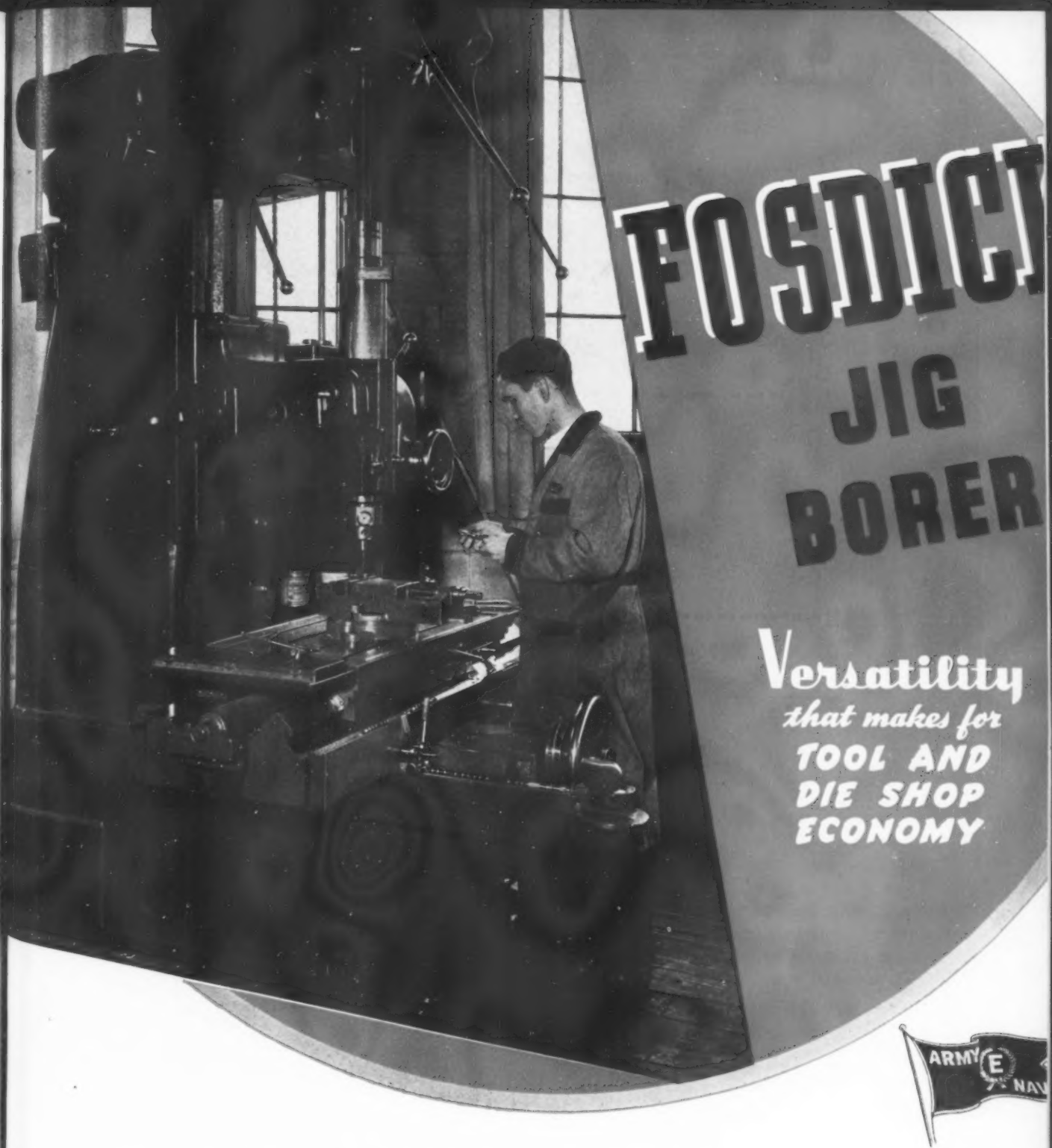
GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

THE NILES TOOL WORKS CO.

THE HOOVEN, OWENS, RENTSCHLER CO.

GENERAL MACHINERY ORDNANCE CORPORATION



FOSDICK JIG BORER

Versatility *that makes for* TOOL AND DIE SHOP ECONOMY

ARMY E NAV

● The versatility of the Fosdick Jig Borer is of specific interest to Tool and Die Shops not only from its productive capacity but because of the need for flexibility and ease of set up.

The Fosdick Jig Borer fits into the diversified run of production of the Tool and Die Shop both because of its capacity to handle a wide variety of work and its ease and speed of operation.

This flexibility has been of particular interest to many plants engaged in war work for jobs on which time and costs did not permit the designing and manufacturing of jigs and fixtures. Thus Fosdick Jig Borers are meeting the need for flexible machine tools required in the production of many war jobs.

If you're interested in flexibility with economy on your jig borer operations you'll be interested in the Fosdick Jig Borer.

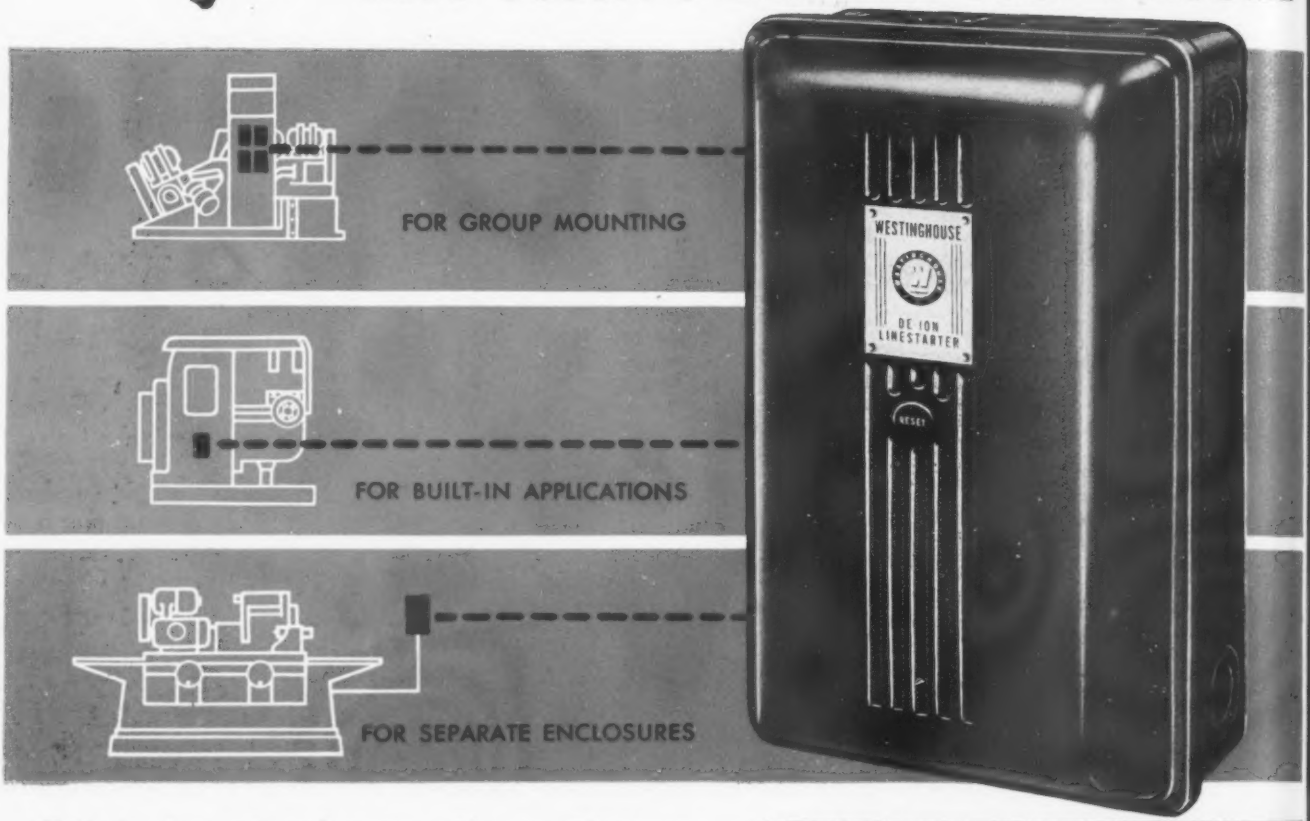
For detailed information on Fosdick Jig Borers write for Jig Borer Bulletin J. B. A.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI · · · OHIO

NEW LINESTARTER

FITS PERFECTLY

INTO TODAY'S MACHINE TOOL PICTURE



Both in size and performance, this new Linestarter measures up to the requirements of modern machine tool design for compactness, easy mounting and dependable, trouble-free operation.

It is compact—ideal for group mountings and built-in applications. No crowding—all parts are quickly front-accessible.

It is flexible—coil is front-removable. Overload relay may be adjusted for either manual or automatic reset.

Sturdy and efficient, it is designed to give across-the-line starting, stopping, and overload protection under grueling 3-shift schedules. The armature is self-aligning—features a knife-edge bearing of nitrided steel that guarantees positive, accurate contact alignment. Service life of contacts is greatly increased by new, double-break construction.

Ask your Westinghouse representative for further details or write for Bulletin 3185. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., Dept. 7-N. J-21254

NEW DESIGN FEATURES

SIZE 2 LINESTARTER

for A. C. polyphase motors up to 15 hp, 220 volts; 25 hp, 440, 550 or 600 volts

- **"De-ion" arc quenching—prolongs the contact life.**
- **Hand or automatic reset Bi-metal overload relay.**
- **Knife-edge bearing—an exclusive Westinghouse feature.**
- **Interlocks—space for as many as four.**

Westinghouse MOTORS AND CONTROLS

☆ *for your convenience* ☆ *for prompt delivery*

☆ *for faster production*

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BUFFALO, N. Y.	HARTFIELD-HEALY SUPPLY CO., INC.	MILWAUKEE, WIS.	REDI-PRODUCTS COMPANY
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CLEVELAND, OHIO	MID-WEST ABRASIVE COMPANY	DALLAS, TEX.	KEYSTONE TOOL & SUPPLY CO.
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DETROIT, MICH.	MID-WEST ABRASIVE COMPANY	OAKLAND, CALIF.	THE CHAMBERLAIN COMPANY
GRAND RAPIDS, MICH.	BARCLAY AYERS & BERTSCH CO.	PORTLAND, ORE.	J. E. HASELTINE COMPANY
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Manufacturers of DEPENDABLE Abrasives

1960 E. MILWAUKEE AVENUE **DETROIT, MICHIGAN**

FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

Mid-West

★ *Honing Stones*
★ *Superfinishing Stones*
★ *Grinding Wheels*
★ *Emery Cloth*
★ *Sandpaper*

Mid-West Abrasive Company,
1960 E. Milwaukee Avenue,
Detroit, Michigan

Gentlemen: Please send me additional information on Mid-West Micro Bond honing and superfinishing stones.

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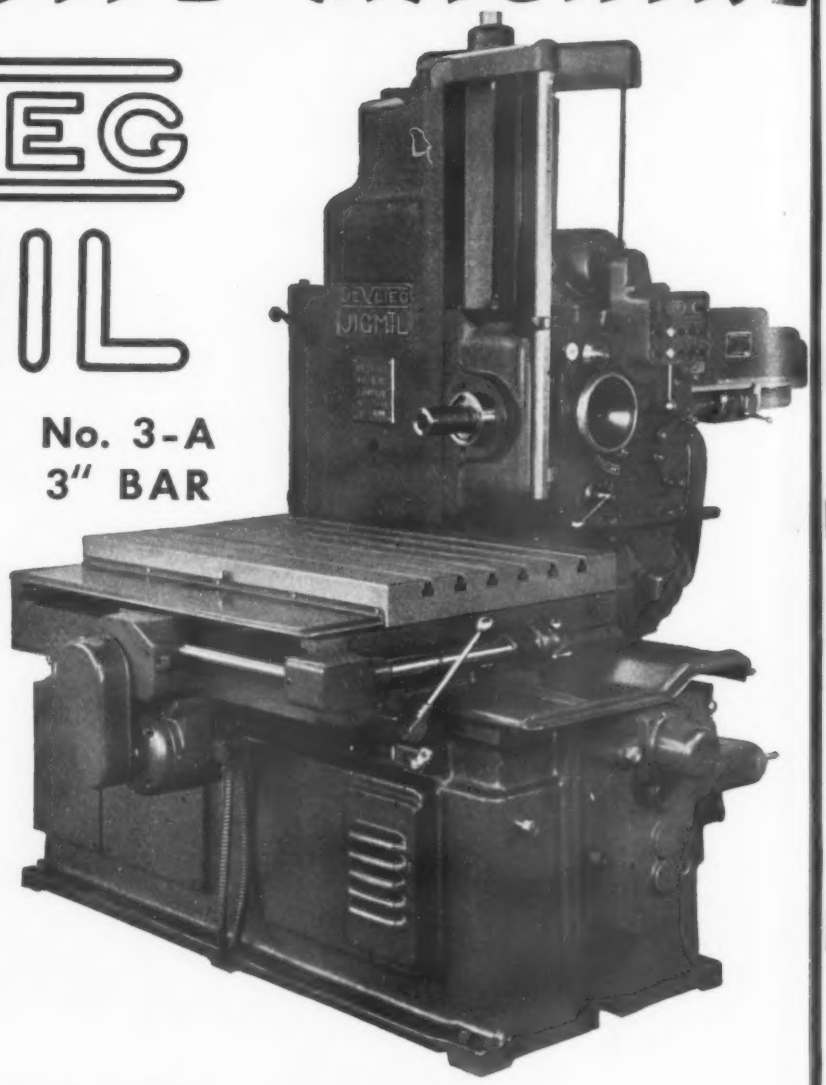
*Company*_____

*Address*_____

A NEW TYPE MACHINE

DEVLIEG JIGMIL



No. 3-A
3″ BAR

To more accurately and speedily serve the broad field needing a machine having

• • •

THE SPACING ACCURACY OF A JIG BORER

• • •

THE PERFORMANCE QUALITIES OF A MILLING MACHINE

• • •

THE CONVENIENCE AND FLEXIBILITY OF A HORIZONTAL BORING MILL

☆ A PRECISION MACHINE ☆

Featuring

NEW SPEED OF OPERATION

NEW ADVANCED FINGER TIP CONTROLS

NEW STANDARDS OF EXCELLENCE OF BORED HOLES

NEW ACCURACY IN MILLING

AUTOMATIC TABLE RETRACTION AND REPOSITIONING

Many machines in operation show 75% greater average daily productivity and improved dependability for precision.

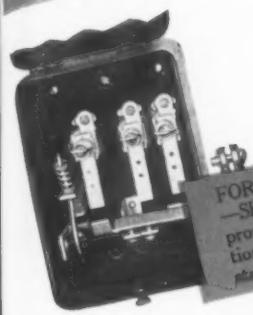
Write for Circular

DEVLIEG MACHINE COMPANY
450 FAIR AVENUE, FERNDALE (DETROIT), MICHIGAN

DEVLIEG MACHINE TOOLS

Before You Order "SPECIALS"

CHECK THESE STANDARD G-E MOTOR CONTROLS



FOR REMOTE CONTROL—Shipper-rod pilot controls to provide undervoltage protection when used with magnetic starters.

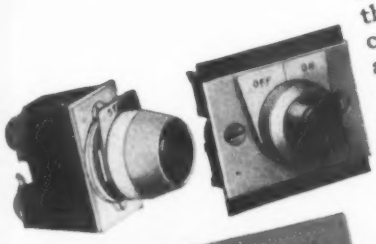
FOR LIMITING CONTROL—Standard limit switches for automatic control of lathes, boring machines, etc.

FOR STRAIGHT-LINE CONTROL—More than 25 standard a-c and d-c solenoids for almost any machinery application.

FOR QUICK-STOP CONTROL—Standard plugging switch saves time on machines that must be started and stopped frequently.

FOR PILOT CONTROL—Standard pilot control switches to mount directly on the magnetic machine-controller.

FOR CENTRALIZED CONTROL—Standard push buttons to provide centralized control for multiple-operation machines.



FOR ON-THE-SPOT CONTROL—Standard, oil-proof push-button units for mounting directly on the machine.

By combining standard controls to perform special machinery control functions—you realize all the advantages of specials without any of their disadvantages. Many of your design problems are simplified because our engineers will assume full responsibility for the selecting and assembling of standard controls to provide just the kind of special control operation that you require. Then too, standard controls—unlike many specials—have been tested for reliable operation under the severest conditions. And what is even more important today, the use of standards conserves critical materials.

More than a thousand standard G-E control accessories—only a few of which are shown on this page—make it possible to combine standard controls to meet almost any special problem.

Before you say "special," see your local G-E sales engineer to be sure that you are making fullest use of the wide variety of standard G-E machinery controls. *General Electric, Schenectady, N. Y.*

GENERAL ELECTRIC

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For

FACTS *about* MULTIPLE THREAD MILLING CUTTERS . . . *Why look over the other fellow's shoulder?*

THIS new book contains a great deal of useful and practical information for anyone who works with multiple thread mills. It was written by men with long experience in this specialized field and is as complete as it is authoritative.

The book contains: descriptions and illustrations of the various types of thread mills, important design considerations, methods of use and how to avoid trouble, tolerances in manufacturing ground and unground thread mills, and methods for proper sharpening. With great numbers of multiple thread mills now in use for war production, it is important that this information be in the hands of those responsible for getting the most out of these tools.

This book should serve to clarify many problems which have arisen under war conditions. Not the least of these is the proper specification of thread mills to assure promptest delivery, and the proper methods of sharpening to assure longest life.

Get a copy of this NEW BOOK for yourself . . .

We have already given this book wide distribution, through our mailing list, and you may have seen it "over the other fellow's shoulder." If you want a copy of your own, please write us on your company letterhead, and we will send you one promptly. If you should want to order a quantity, such as for training purposes, there will be a small charge per copy.

Buy WAR SAVINGS *Bonds*

BARBER B-C COLMAN PRODUCTS: HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

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GENERAL OFFICES AND PLANT • 201 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

What ever happened to the Horse Collar Market?

Who won the World Series in 1935? Who was vice-president under Harding? Of 1481 makes of American automobiles, 16 are known today. How many of the *others* can you name? And what ever happened to the carriage wheel business, and where's the horse collar market?

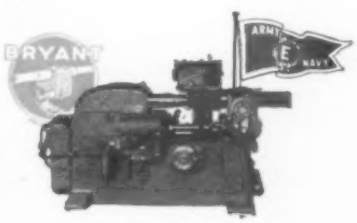
People, products, markets and methods all succumb to *change* . . . and today that powerful factor of change is doing more to disrupt markets, create new products, and revise production methods than most businesses are even remotely prepared for!

A soap company and a roofing company are operating shell-loading plants. Shipbuilders are building cargo planes. The automotive industry is producing farm machinery, locomotives, air conditioning equipment, and literally hundreds of other unrelated products. Manufacturers are this year spending hundreds of millions of dollars on research alone, and the day this war ends, a new age of production will begin.

Part of this story of change we know first hand, as only specialists can. That part is in the vital and highly specialized field of internal grinding . . . and this much we can tell you on the basis of our own experience with the amazing developments in production that we have seen and helped to produce:

If your business is manufacturing with metal, and if you are planning ahead today for the products you will manufacture tomorrow, the surest way to protect your business against failure from uneconomical production methods is to consult with the leading specialists in machine tool engineering.

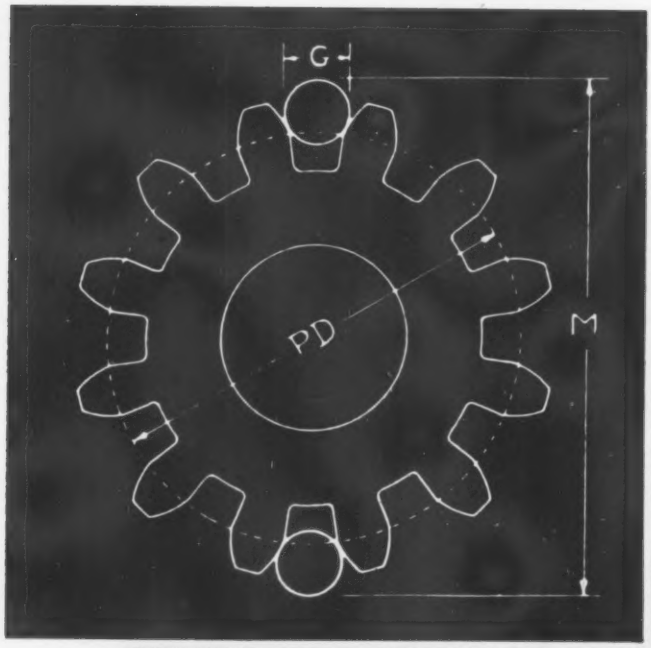
Bryant's Consulting Service is available to you at all times. Call upon us now!



Bryant Chucking Grinder Company

SPRINGFIELD, VERMONT, U. S. A.

SEND FOR THE MAN FROM BRYANT



How to Check

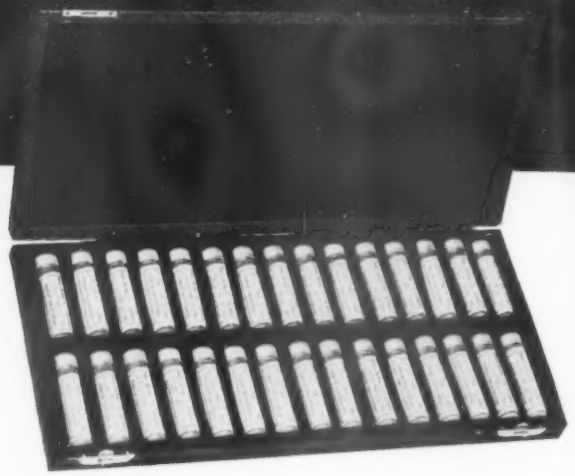
your gears more accurately with the

Van Keuren

SIMPLIFIED MEASURING SYSTEM . . .

"Ultimate Accuracy"

for EXTERNAL *and* INTERNAL SPUR GEARS



The Van Keuren gear measuring system provides a series of wire diameters for external spur gears based on $\frac{1.728"}{DP}$ and a series for internal spur gears based on $\frac{1.44"}{DP}$. This provides a maximum number of wire sizes which are exact when expressed in even thousandths of an inch and also results in 5 sizes which may be used either for external or internal gears. A total of only 47 sizes of wires will provide for measuring both external and internal gears from 2 to 80 DP. Complete tables which require no interpolation are supplied with the gear wire sets for measuring 14½°, 17½°, 20°, 25° and 30° pressure angle gears from 10 to 171 teeth.

The checking of a gear is easily accomplished as shown by the following example.

Given: A 26 tooth external spur gear of 12 DP (diametral pitch) and 14½° pressure angle.

Procedure	Computations
1. Use 12 DP wires	Wire size = $\frac{1.728"}{12}$ = .144"
2. Place wires in opposite tooth spaces and make a measurement over the 2 wires.	Measurement over wires = 2.3650"
3. Calculate theoretical measurement over wires for a perfect gear.	M for 1 DP, 14½° gear of 26 teeth from Van Keuren Gear tables .....28.4315"
3. (Continued)	M for 12 DP = $\frac{28.4315}{12}$ = 2.3693"
4. Subtract actual measurement	2.3650"
5. Gear is undersize	.0043"

The Van Keuren simplified gear measuring system is based on involute trigonometry formulae by Buckingham given on pages 27 and 28 in "Manual of Gear Design" Section Two (Approved by American Gear Manufacturers' Association). The computation of the tables on measurement are by Dr. C. H. Havill and staff, Eclipse Aviation, Bendix, New Jersey.

Send for catalog No. 31 giving complete gear tables.

THE Van Keuren COMPANY 176 WALTHAM ST., WATERTOWN, MASS.

Light Wave Equipment Light Wave Micrometers Gage Blocks Taper Insert Plug Gages Wire Type Plug Gages
Measuring Wires Thread Measuring Wires Gear Measuring System Shop Triangles

Precision GAGES

★ **THREAD GAGES IN STOCK**

Standard National Coarse and National Fine Plug and Ring Gages ready for immediate delivery.

★ **PLUG AND RING GAGES MADE TO A G D STANDARDS**

★ **SPECIAL GAGES MADE TO YOUR PRINTS**

Write Today for Complete Information

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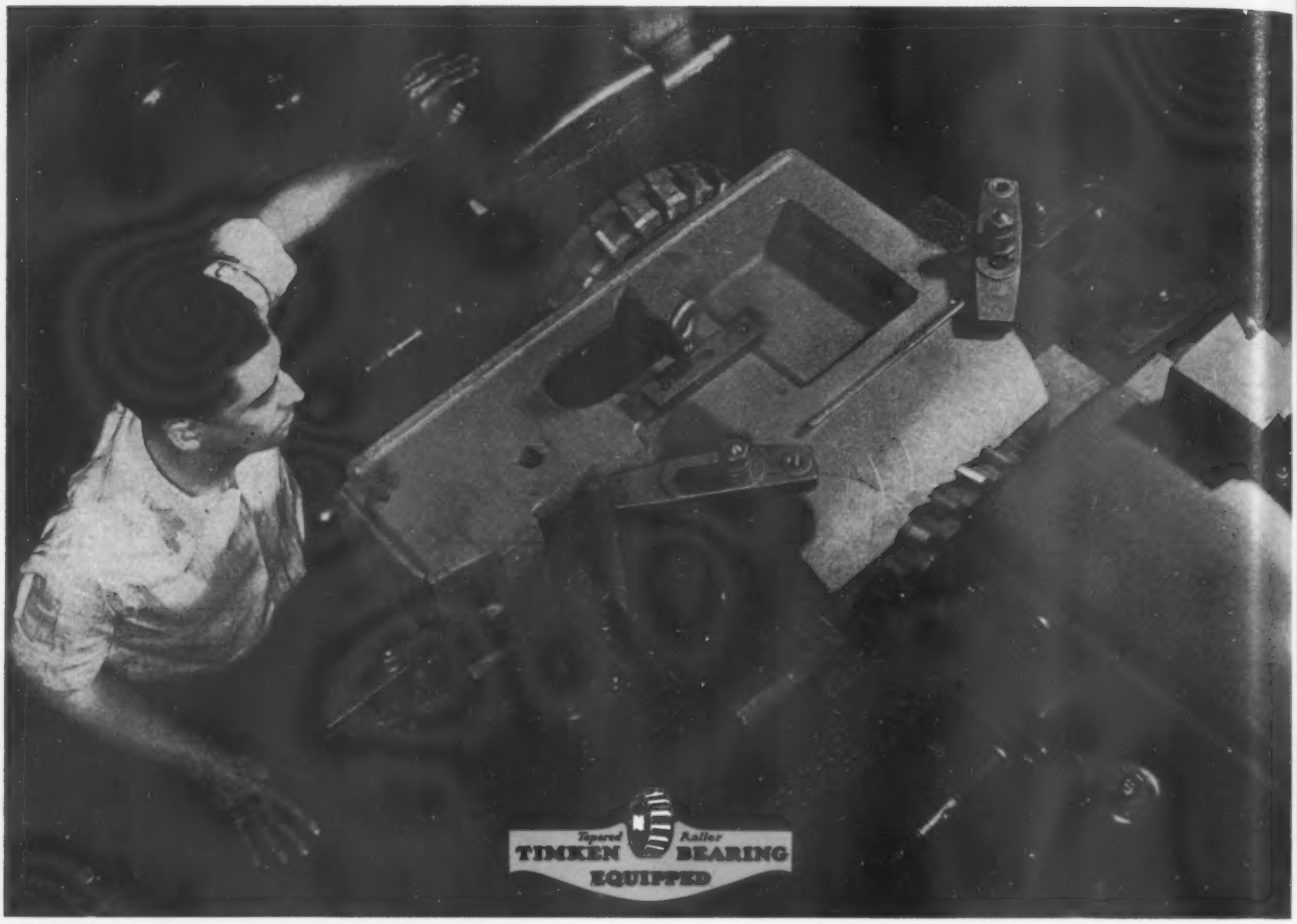


Cincinnati 4-48 Duplex Hydromatic Milling Machine equipped with 40 Timken Bearings milling the top and bottom of a small vertical milling machine bed (column cast integrally) simultaneously. Thus precision begets precision.

Help the swing to Victory with faster, more accurate machines. Redesign to use more Timken Bearings. Assure success in post-victory competition.

"All There Is In Bearings"

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

Timken Tapered Roller Bearings improve performance wherever they are applied. A few Timken Bearings are better than none in any kind of equipment, but for maximum results you must have them at every suitable position. In machine tools that means spindles, gear boxes, tail-stocks and feed mechanisms.

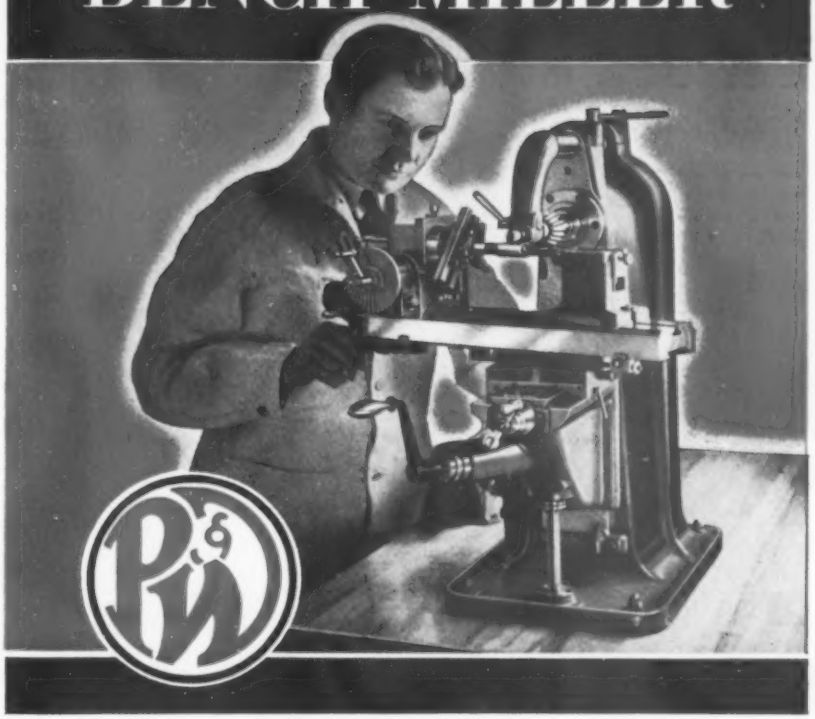
Thus, full protection against friction; radial, thrust and combined loads; and misalignment of moving parts is provided for; speed is increased; precision multiplied; endurance extended; operating and maintenance costs reduced.

Engineers who use Timken Bearings in this way give their companies a twofold advantage —*better* machines and *better selling* machines; because buyer preference follows the trade-mark "TIMKEN" wherever it is used. The Timken Roller Bearing Company, Canton, Ohio.

The one test for every decision, *Will it help to win the war?*

Don't tie up Big Millers on small, precision jobs

PRATT & WHITNEY
No. 3 Model "C"
UNIVERSAL
BENCH MILLER



NOW BREAKING many a bottleneck in toolrooms and on production lines as well, the P&W Bench Miller is a companion piece to the famous P&W Bench Lathe. Within its range, it handles *all* the jobs done on large, expensive, floor type millers . . . and, with its wide variety of special attachments, handles them *faster, more accurately, and more easily.*

OF SPECIAL INTEREST to owners of P&W Bench Lathes is the fact that the P&W Bench Miller of corresponding model has *completely interchangeable* headstock, collets, arbors, etc. Headstock, *with work undisturbed*, can be moved from one machine to the other, for a series of operations. This makes possible a degree of precision control which cannot be duplicated by other methods.

Get Details Now!

Company executives will receive free copies of this new bulletin if they will send their requests on their company letterheads.

PRATT & WHITNEY
Division Niles-Bement-Pond Company
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XLO

EX-CELL-O *means* PRECISION

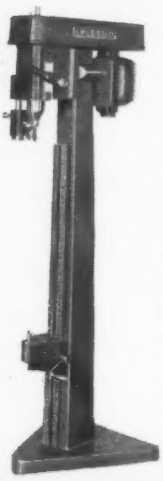
For Accuracy and Speed...

. . . there's only one standard at Ex-Cell-O—the designing and making of the finest machine tools and cutting tools that the most highly trained engineers and craftsmen can produce. This is why the Ex-Cell-O trademark—whether on a large machine like a precision thread grinder or on a small cutting tool like a counterbore—is positive assurance of a precision-built product to do a real precision job . . . why Ex-Cell-O precision machine tools and cutting tools are forming a vital part of today's war production accomplishment!

EX-CELL-O CORPORATION • DETROIT

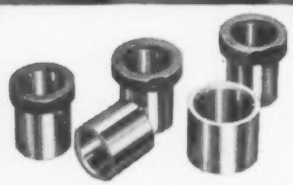
HYDRAULIC POWER UNITS

Ex-Cell-O Hydraulic Power Units provide an economical method of drilling, reaming, countersinking or spot-facing. These operations may be performed in multiple. These units may also be used as prime movers or drivers for other machine units. Send for Ex-Cell-O Catalog No. HU 235.



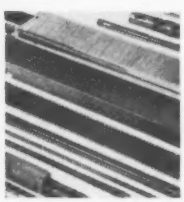
CENTER LAPPING MACHINES

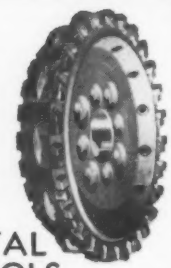
To obtain the closer tolerances required in thread grinding and "O. D." grinding operations on precision parts, female centers must be accurately conditioned. Ex-Cell-O Center Lapping Machines are designed to correct distortion from heat-treating and the inaccuracies of rough centers. Illustrated is Ex-Cell-O Style 74. Send for Ex-Cell-O Catalog No. 40121.



DRILL JIG BUSHINGS

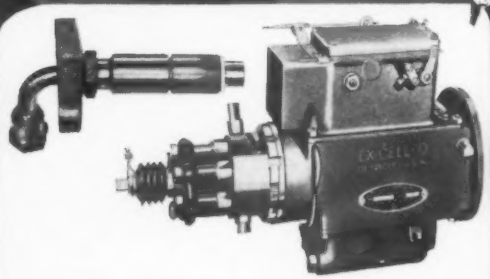
Ex-Cell-O Drill Jig Bushings, made to A.S.A. Standards. For a complete list of standard sizes, write for Ex-Cell-O Catalog No. 11882.





CONTINENTAL CUTTING TOOLS

These include broaches, ground form tools, counterbores and counterbore sets (with Continental's indestructible drive), inserted blade milling cutters, carbide tipped tools. Send for Ex-Cell-O Catalog No. 11081.



FUEL INJECTION EQUIPMENT

Ex-Cell-O Diesel Fuel Injection Equipment is made for installation by Diesel Engine builders (marine, industrial, and automotive). Both Ex-Cell-O Pump and Ex-Cell-O Nozzle are built to the high precision standards of Ex-Cell-O. Send for Ex-Cell-O Catalog No. 391221.

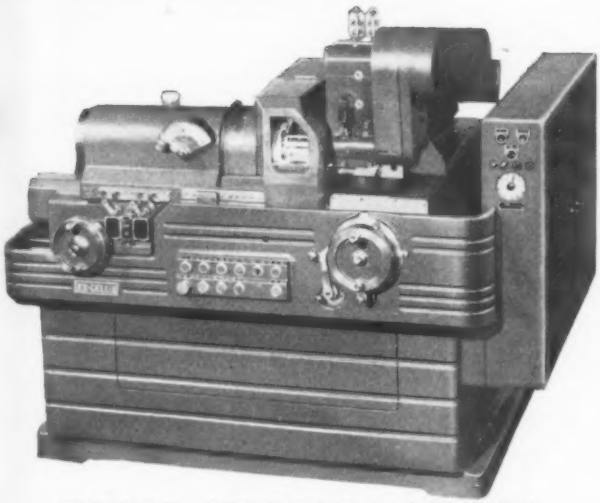
Precision THREAD GRINDING, BORING AND LAPPING MA
POWER UNITS • GRINDING SPINDLES • CONTINENTAL UT
INJECTION EQUIPMENT • PURE-PAK CONTAINER MACHINES

CARBIDE TOOL GRINDERS

Six styles of tool grinders, varying in size and capacity from a compact, bench-type grinder to a heavy-duty, double-end machine for grinding large size turning, boring, facing and planer tools of carbide, Stellite and high speed steel. Send for Ex-Cell-O Catalog No. 46101.

INTERNAL LAPPING MACHINES

Used for rapid precision finishing of small holes, eliminating difficult grinding and expensive finishing operations. Design of the lapping stone and mandrel assemblies enables parts in which the holes are interrupted to be precision lapped. Send for Ex-Cell-O Catalog No. 41102.

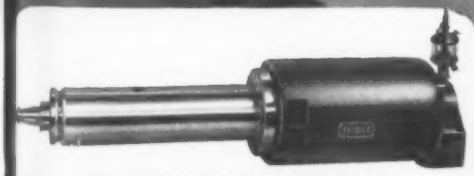


THREAD GRINDING MACHINES

Many manufacturers of precision threaded parts now depend on thread grinding machines to obtain the extreme accuracy that modern industry and the nation's war program demand. Higher production . . . greater accuracy . . . more economy . . . making threads "from the solid" on hardened blanks . . . easily threading parts of materials difficult to thread by other methods—these are some of thread grinding advantages. (Illustrated above: Style 39-A Internal Thread Grinder.) Send for Ex-Cell-O Catalog No. 48521 (complete line includes 9 styles).

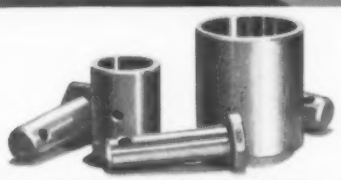
PRECISION BORING MACHINES

There are nine styles for boring, turning and facing to extremely close uniform limits with high finish. Hydraulically or manually operated fixtures designed for each job. Simple and economical in operation, these machines can be set up for a wide variety of work. Of sturdy, compact construction, each style of Ex-Cell-O Precision Boring Machines is designed and built to precision standards and made for accuracy and speed in modern production. Send for Ex-Cell-O Catalog No. 31401.



GRINDING SPINDLES

Ex-Cell-O manufactures precision ball-bearing spindles for internal, surface and universal grinding machines—as original equipment and as replacement. Send for Ex-Cell-O Catalog No. S 537.



R. R. PINS AND BUSHINGS

Ex-Cell-O makes hardened and ground steel Bushings and Pins for American railroads. For all standard sizes, send for Ex-Cell-O Catalog No. 32301.

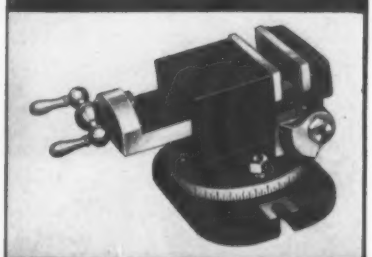
To obtain best use of your Ex-Cell-O equipment, send for Ex-Cell-O Instruction Book. State style of machine you are using.

PPING MACHINES • TOOL GRINDERS • BROACHES • HYDRAULIC
NTAL UTTING TOOLS • DRILL JIG BUSHINGS • DIESEL FUEL
HINE R. R. PINS AND BUSHINGS • PRECISION PARTS

1943 Styles
FOR WOMEN *in* WAR PLANTS

Universal Angle - Style "A" and "B"

Horizontal Universal - Style "D"



Tilting Swivel Style "G" and "H"

TOOLS—Fashioned for Victory Production!

America's women are proving their ability in America's war plants. On many jobs they produce more efficiently than men—when provided with fast, accurate, easily-operated machine tools such as Covel Style No. 15 Hand Feed Surface Grinders and Covel Precision Vises in the styles shown here. Greater volume is natural because No. 15 Surface Grinder is ideally suited to women operators—Accurate, clearly graduated, convenient controls—quick, easy job set-up—clear visibility—ample room to work comfortably. These time-saving, cost-cutting Covel features, and many more, are described in Bulletin A-53—get your copy today.

Prompt Delivery to War Industries

SHORTEN EMPLOYEE TRAINING TIME WITH COVEL EQUIPMENT

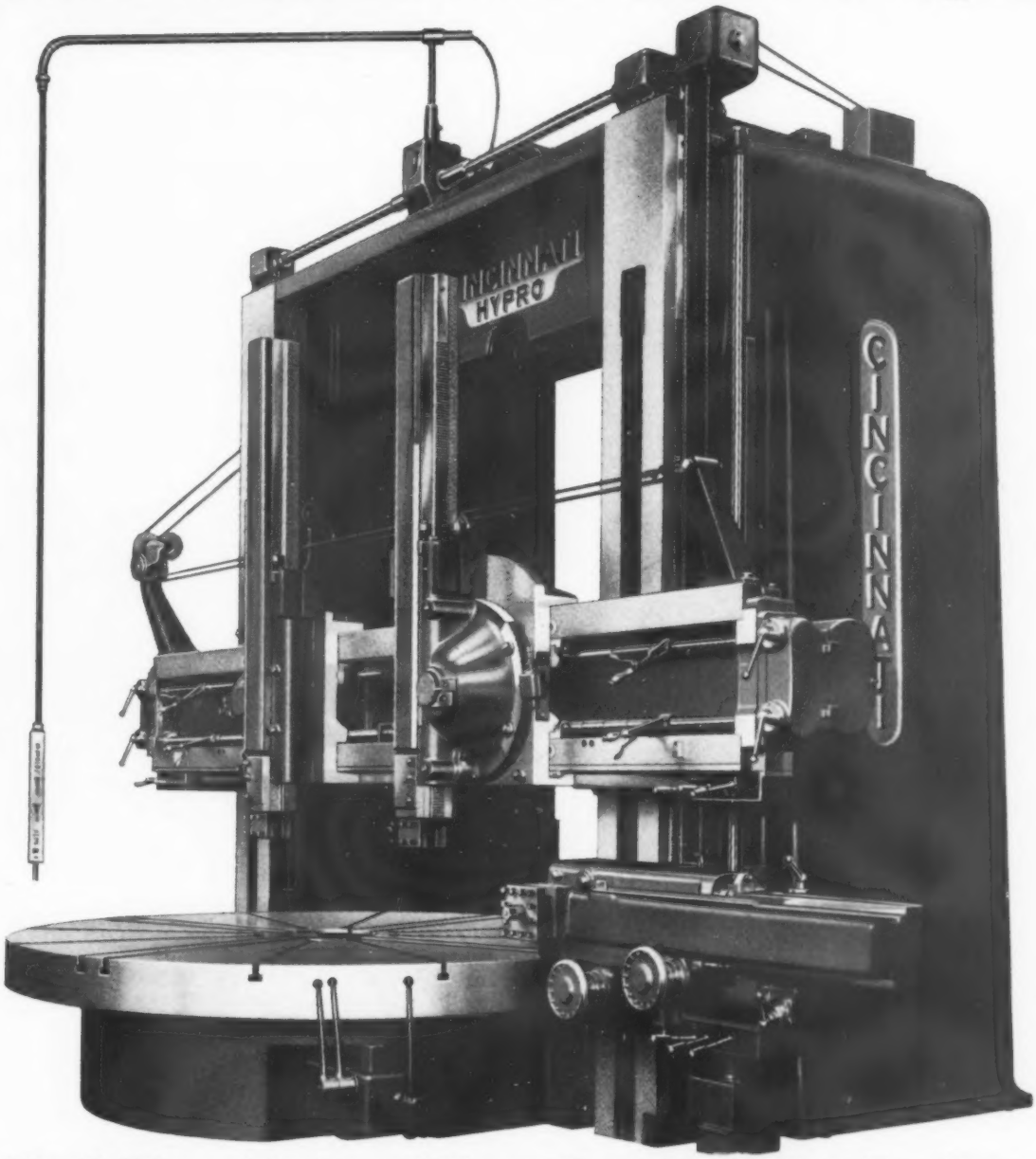
Grinding Machinery Since 1874

COVEL INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICH.

CINCINNATI Hypro

10' Vertical Boring Mill



Check These Cincinnati Hypro Features Before You Buy:

TABLE OF EXTRA DEPTH SUPPORTED BY FLAT TRACKS AND ANTI-FRICTION BEARINGS

PYRAMID TYPE HOUSINGS

ONE-PIECE BED AND SPEED BOX

SPIRAL BEVEL STEEL RING GEAR

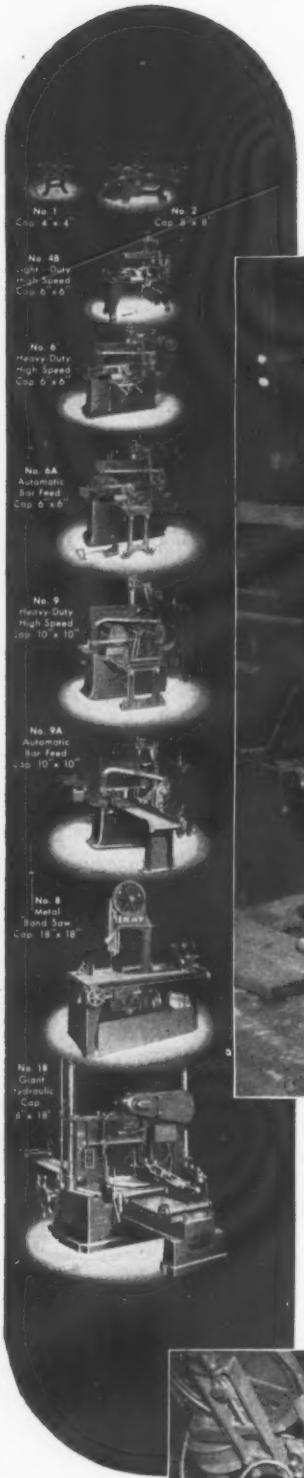
COMPLETE INDIVIDUAL FEED, RAPID TRAVERSE AND REVERSING MECHANISM FOR EACH HEAD

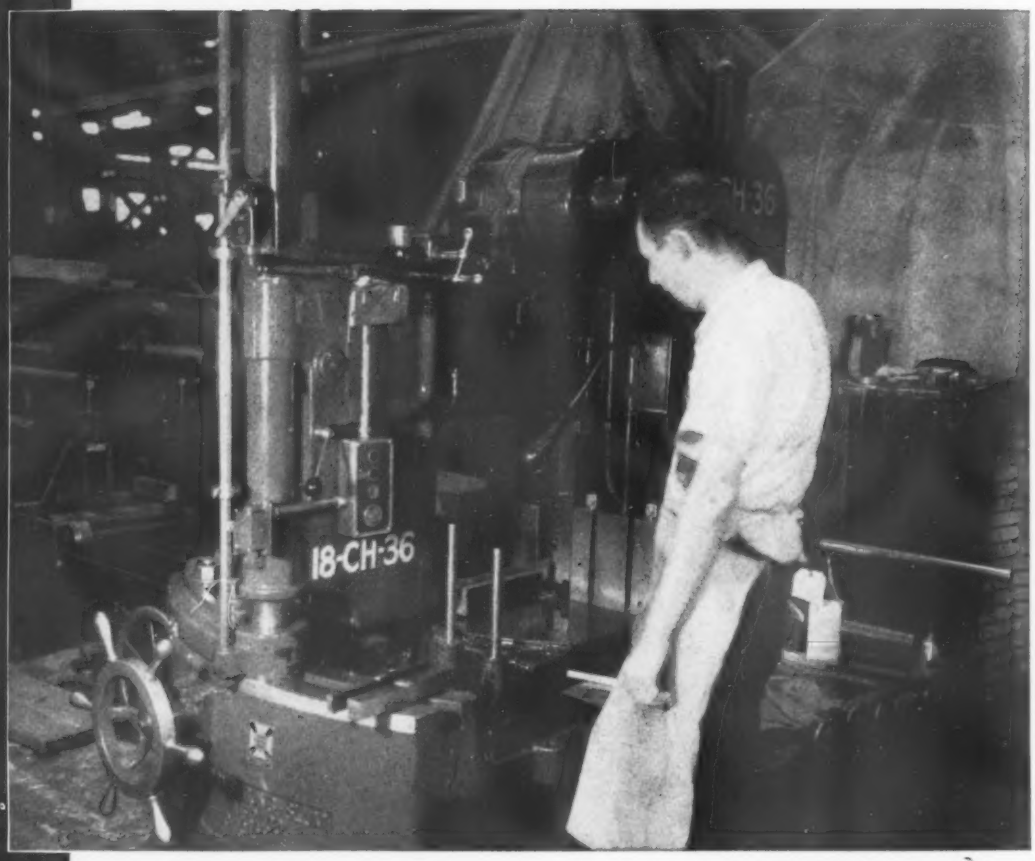
THE CINCINNATI PLANER COMPANY

Planers...Vertical Boring Mills...Planer Type Millers

CINCINNATI . OHIO . U.S.A.

MARVEL SAWS





(ABOVE.) The MARVEL No. 18 Hydraulic Hack Saw shown in action at the Philadelphia Navy Yard cutting a test piece of heavy plate.

For Thin Tubes or Heavy Plate!

Two shipbuilding jobs—one at the Philadelphia Navy Yard and one at the New York Shipbuilding Corporation—demonstrate the wide variety of jobs that can be performed on MARVEL Sawing Machines. Producing a clean 45° mitered cut in tubing of thin cross-section, or sawing through thick sections of heavy plate are just two of the many jobs that can be turned out with speed and economy on MARVEL Saws.

Take advantage of MARVEL Free Technical Service! At your request a competent MARVEL Engineer will study your metal-cutting problems and make recommendations for increasing your metal sawing efficiency to meet the increased demands of defense production.

(AT RIGHT.) At the New York Shipbuilding Corporation, a MARVEL No. 8 Universal Tool Room Sawing Machine finds wide application in cutting bars, tubes, etc., either straight through or at any desired angle up to 45°. The machine will accommodate one or more pieces of stock up to 12" square in cross-section.

ARMSTRONG - BLUM MFG. CO.

"The Hack Saw People"

5700 Bloomingdale Ave., Chicago, U.S.A.

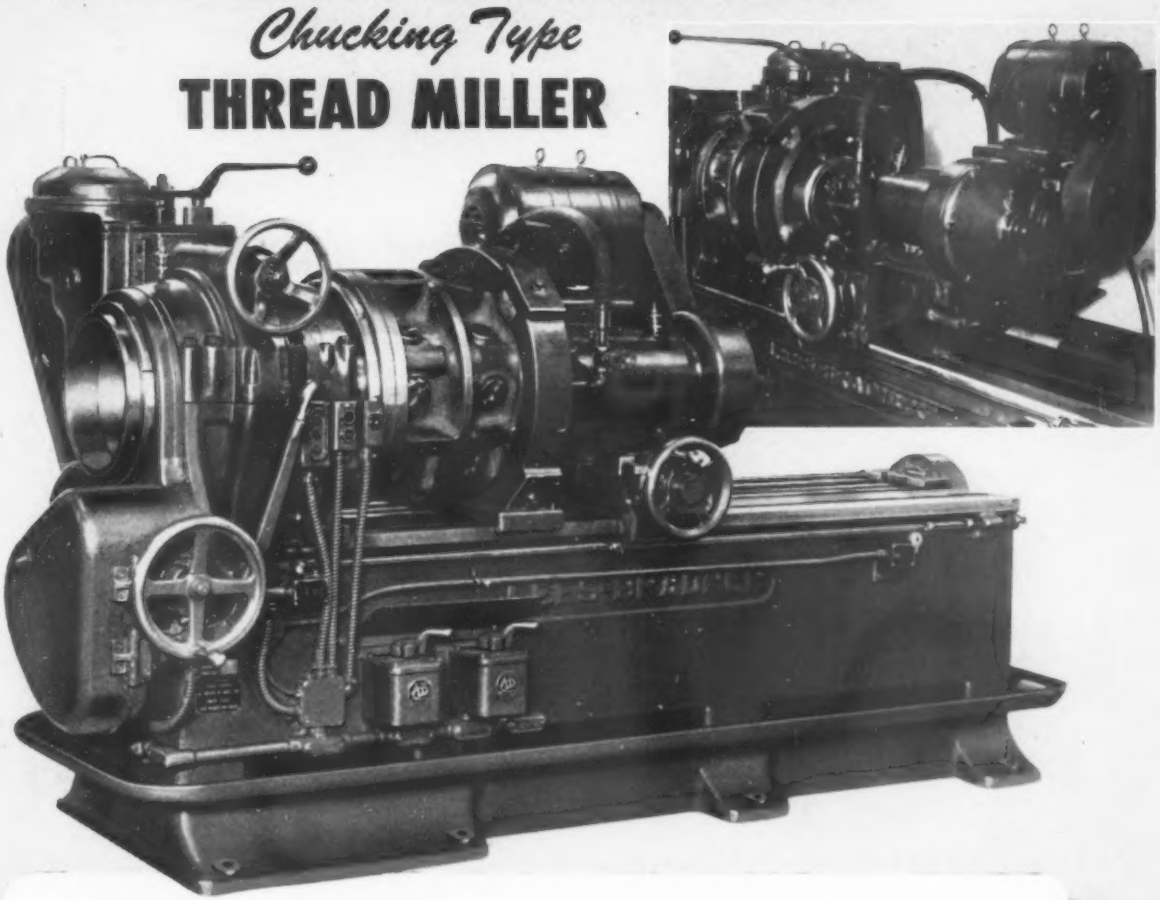
Eastern Sales Office: 225 Lafayette St., New York

More Cannon–faster–for our front lines

with LEES-BRADNER

Chucking Type

THREAD MILLER



● The Lees-Bradner Model CT, arranged with a special pot chuck fixture, is used widely for the rapid handling of threading, facing, and milling ordnance to amazing tolerances.

Milled threads produced on Lees-Bradners speed the production of cannon for many of the builders of guns in plants in this country and in those of our Allies.

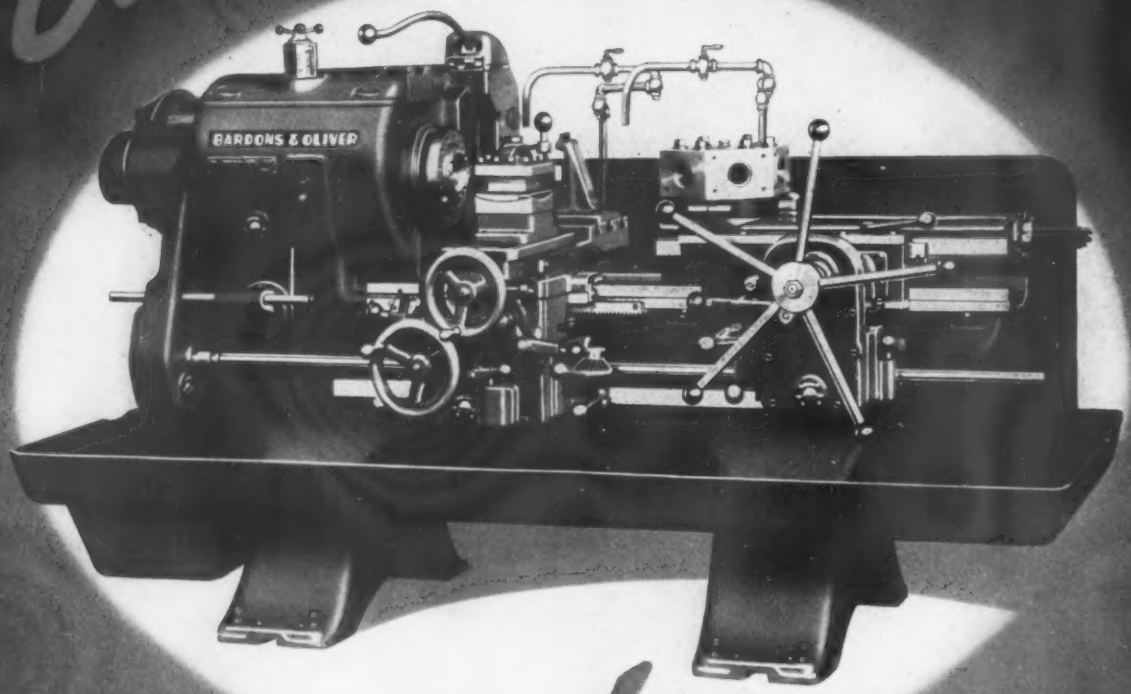
Lees-Bradner designed and engineered installations, similar to the ones shown for the handling of 105 m/m Howitzer breech rings, help in the building of this gun on a production basis to rigid ordnance requirements. By employing the thread milling process breech rings are threaded, milled, and faced in a fraction of the time once required for this critically exacting operation.

Why not investigate the advantages of the milling process as applied to your threading requirements?

The LEES-BRADNER *Company*

CLEVELAND, OHIO, U.S.A.

Bardons & Oliver



Leadership...

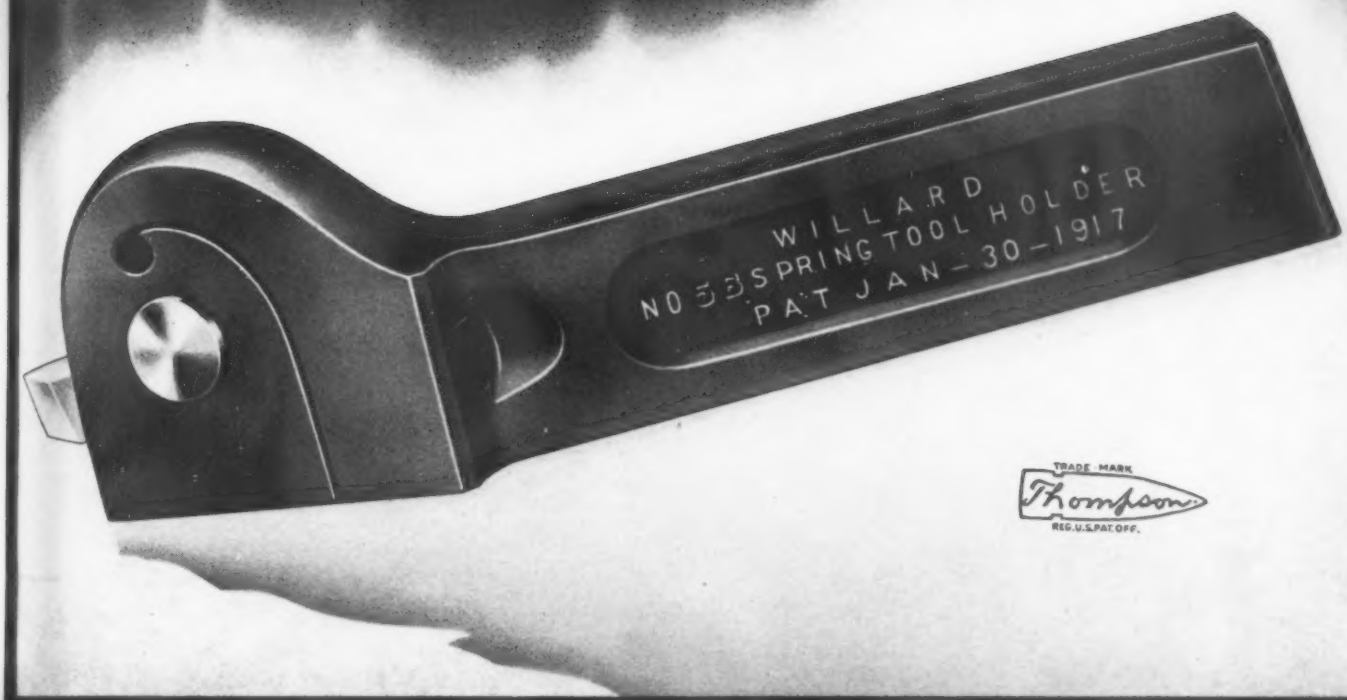
Bardons and Oliver

HAS BEEN ESTABLISHED BY PERFORMANCE

BARDONS & OLIVER, INC.

1133 W. 9TH ST. . . . CLEVELAND, OHIO

AN *Essential* TOOL HOLDER



A Willard Spring Tool Holder — is an "essential" in our war-time machine shops and tool rooms. New in design, the "Willard" is efficient, accurate and economical — can be used for all types of threading, coarse or fine. Adaptable to a wide variety of work. The spring feature prevents shock to the cutter — minimizes cutter breakage — makes possible faster and smoother feed with heavier cut. Economical because it eliminates chatter — damaged work is reduced to a minimum. Made in three sizes for ¼" - 5/16" and ⅜" square tool bits. Specify "Willard" for accuracy and economy. Write for further information.

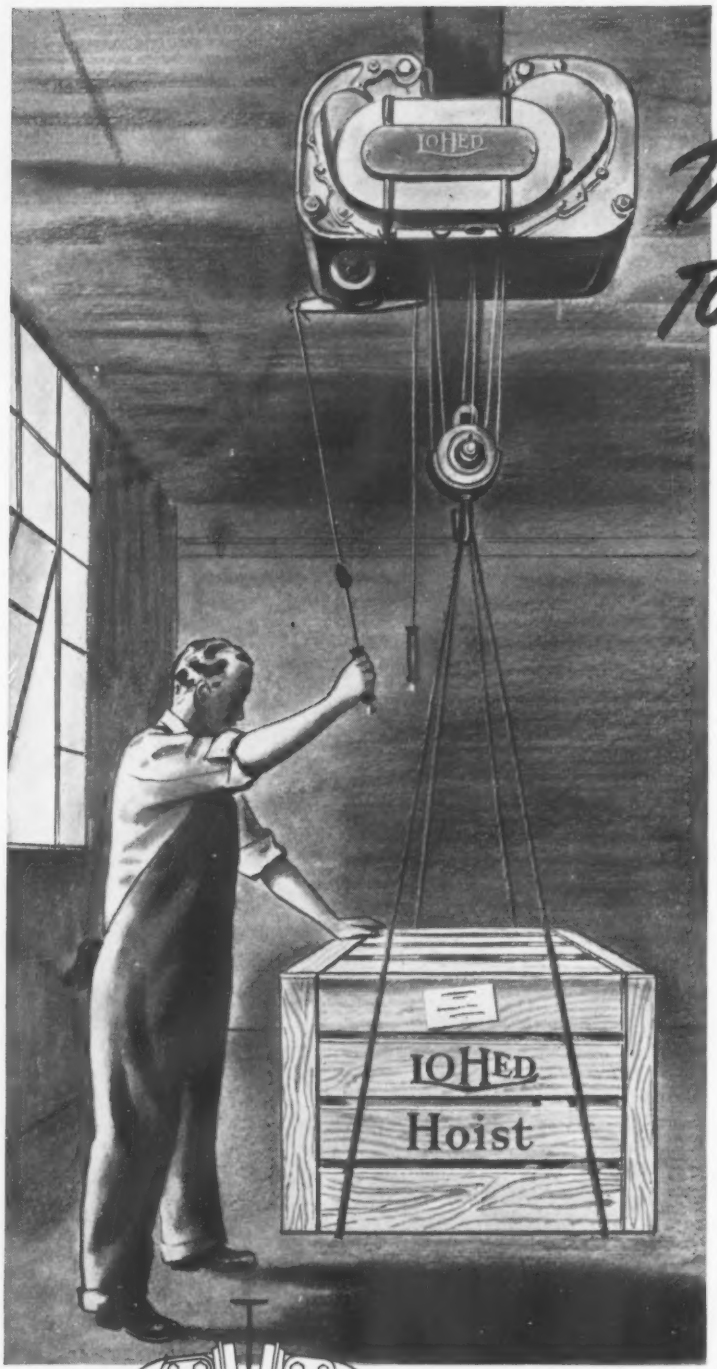
ARMY E NAVY

Awarded to Auto-Ordnance Corporation for excellence in production of "Tommy Guns."

AUTO-ORDNANCE *Corporation*

THOMPSON TOOL DIVISION

342 WEST PUTNAM AVENUE, GREENWICH, CONN.



DELIVERIES ARE TOUGH THESE DAYS BUT...

We're trying to lick them by confining our manufacture to the most popular sized hoists

We suggest, for the present, that if you have a materials handling problem, you write promptly or telegraph us for full information on a Lo-Hed Hoist to meet your needs.

WHAT "BALANCED CONSTRUCTION" MEANS TO YOU

The *balanced* arrangement of motor and drum in a Lo-Hed Hoist allows the hook to be pulled up until it almost touches the beam, giving you minimum headroom—a desirable plus feature for which you pay no premium. This same arrangement makes possible the use of an all spur gear drive from motor to drum.

FEATURES OF LO-HED HOISTS...

HEAVY DUTY HOIST MOTOR: Built especially for hoist service. Ball Bearing. Fully enclosed.

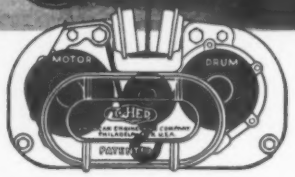
STRONG, SHORT SHAFTS: For strength. Bearing races pressed on ends of shafts to eliminate shaft wear.

HIGH DUTY BEARINGS: On gear shafts and trolley wheels. All main bearings operate in oil bath.

100% POSITIVE AUTOMATIC STOP: Shuts off current and applies holding brake automatically at upper limit of travel.

STRAIGHT LINE SPUR GEAR DRIVE: All spur gear for efficiency.

COVERS: Gearing sealed in oil bath. Controller, motor and drum protected by removable steel covers.



Other A-E-CO Products:
TAYLOR STOKERS
MARINE DECK AUXILIARIES
HELE-SHAW FLUID POWER

The Lo-Hed Hoist can be adapted for operation on any monorail system. There's a Balanced Lo-Hed Electric Hoist for Every Purpose.

AMERICAN ENGINEERING COMPANY (AE CO)

2407 ARAMINGO AVENUE
PHILADELPHIA, PENNA.

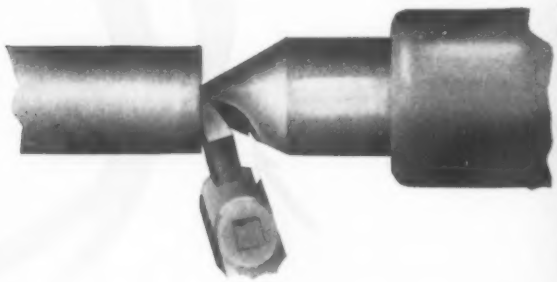
I'm tellin' you·

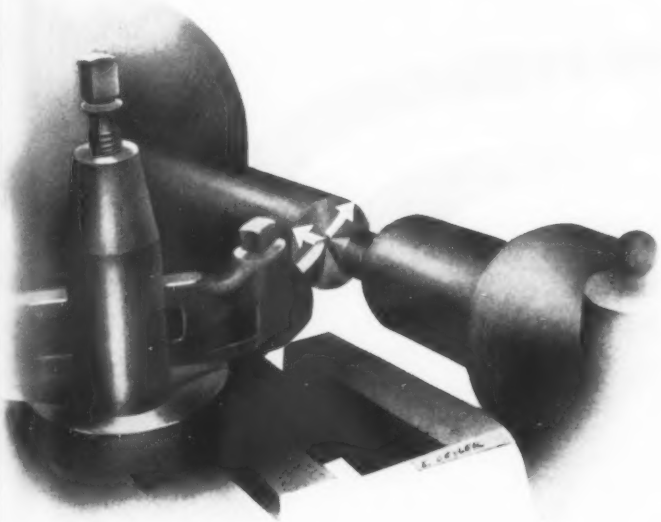
No. 8 in a Series of Tips on "Keeping 'em Turning" by Frank Morris, 42 yrs. at LeBlond

FACING TO LENGTH

Since facing is one of the most common lathe operations, most lathe hands figure they know all there is to know about it. It's not particularly difficult, but I've seen some good men go wrong on these points.

1. You'll save lots of time and effort if you'll keep handy an extra tailstock center that has been grooved or flat ground on the taper. This makes special tools unnecessary because it leaves room for a standard shape tool between work and center. Caution: Be sure flat surface is less than half way through point or it will act as a reamer.





2. For the finishing skim cut, *work from the inside out.* In other words, you start with tool point at the center hole and cut toward outside diameter of the piece with tool edge at slight angle with end of work.

3. Should chatter marks appear on the work, it is because work is running too fast, feed is too great, or angle of tool is too slight. All of these are easily corrected.

SLOW

THE R. K. LeBLOND MACHINE TOOL CO.
CINCINNATI, OHIO

Largest Manufacturer of a Complete Line of Lathes

a Jap's-eye-view of a

WAR WEAPON

SAVE CRITICAL MATERIALS in selection, application and use of electrical equipment.

USE NEWLY DEVELOPED METHODS to speed vital war production.

KEEP EQUIPMENT RUNNING by proper Maintenance and Repair Service.

REPLACE CRITICAL MATERIALS with Micarta and Prestite.

SAVE SCRAP by systematic planning and salvage.

Write today for your free copy of Wartime Conservation, B-3206.

When "sunken" ships come sailing back and "crashed" planes deliver another stick of bombs, the Japs must look with awe on the "weapon" that gives these damaged ships new life. This "weapon" is electric welding. By speeding fabrication and repair, this amazing process is speeding Victory.

There still remain, however, many places on the production front where the latest welding techniques are not being used to full advantage. Westinghouse suggests that you investigate them immediately.

One new process stitches steel together automatically 20 times faster than any other method. Another type of unit requires 30% less critical materials to build, eliminates troublesome arc-blow.

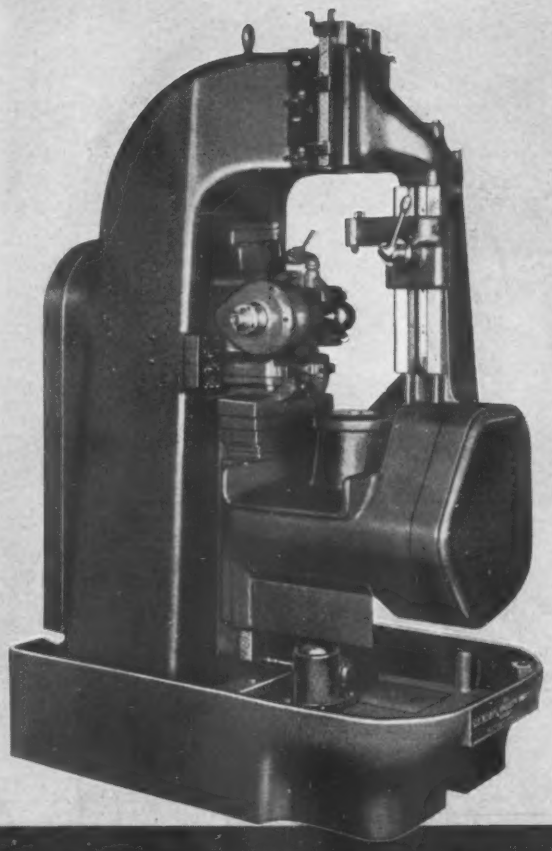
These and other methods of speeding war production and saving critical materials are suggested in the new 100-page book, "Wartime Conservation." Write for your free copy today. Address nearest office or Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

J-21268

WESTINGHOUSE

Westinghouse

PLANTS IN 25 CITIES ... OFFICES EVERYWHERE



Produces Accurate GEARS and HOBBED SPLINES Faster

MODEL 140

The RIGIDHOBBER

● The vertical design and rigid construction of the Rigidhobber accounts for its accuracy and high productive capacity.

The vertical design incorporates a sliding workhead and stationary hob head. A design giving both units support during entire cutting operation. The vertical design also enables chips to fall naturally away from the hob and work spindle.

This widely accepted method is setting new records in maintaining accuracy and high production of gears and splines for vital war production.

Want complete details? Write for bulletin.

HOBBING HELPS *for Boosting WAR Production*

• • •

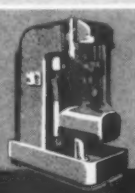
THE HOBBING MACHINE

The hobbing machine consists of seven basic elements:

The Hob Arbor
The Work Spindle
The Index Gears
The Feed Gears
The Index Worm and Gear
The Lead Screw and Nut
The Tailstock

The Hob Arbor must be a precision assembly. It should not run out more than .0003" measured as far as possible from the main bearings. It should not have more than .0001" camming motion. This is measured by placing an indicator against a shoulder on the hob arbor. Additional support is usually given by an outboard bearing, thus the hob is supported on both sides. However, there are some unusual applications with small diameter hobs where no outboard support is possible.

This bulletin tells all about the Rigidhobber—gives specific information on construction and operation—tells the sizes and capacities now furnished

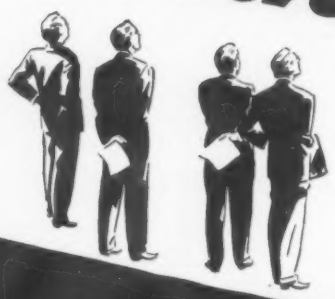


The CLEVELAND HOBBING MACHINE Company

Cleveland ... Ohio

BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS

Read the WAR NEWS before it happens

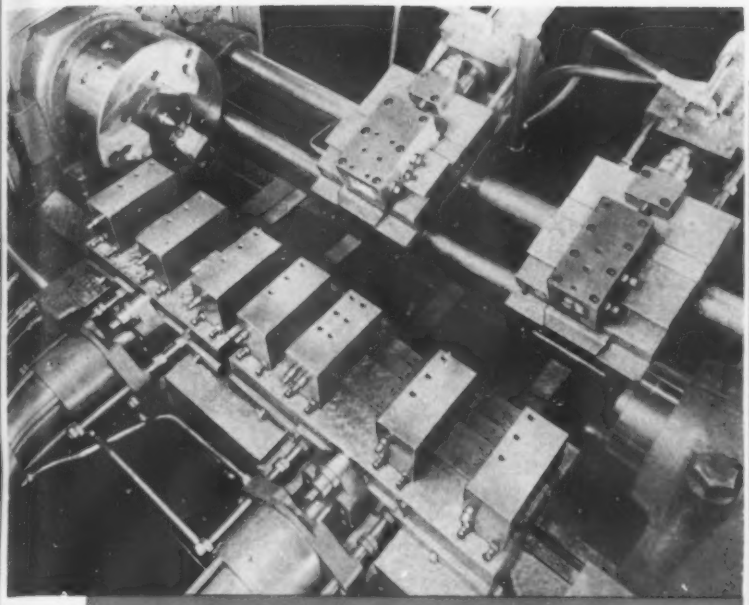


Tomorrow's battle headlines are being written in today's production records. And wherever Veeder-Root Counting Devices are installed, these records are being published continuously, in bold black-and-white figures. So any bad news can be corrected long before it gets into serious trouble . . . trouble that so often develops where there is no constant, accurate Control-by-Count.

For all types of war-production machines, you can get Veeder-Root Counting Devices . . . mechanically or electrically operated . . . to count in any terms or units of performance required. And any of these counters can be installed quickly and easily, without disrupting production. If your work counts in war production today, then help to make the war news good tomorrow. *Count on Veeder-Root.*

Keep War-Production Machines in Step... equip them with VEEDER-ROOT COUNTERS

VEEDER-ROOT INC., HARTFORD, CONNECTICUT, U. S. A.



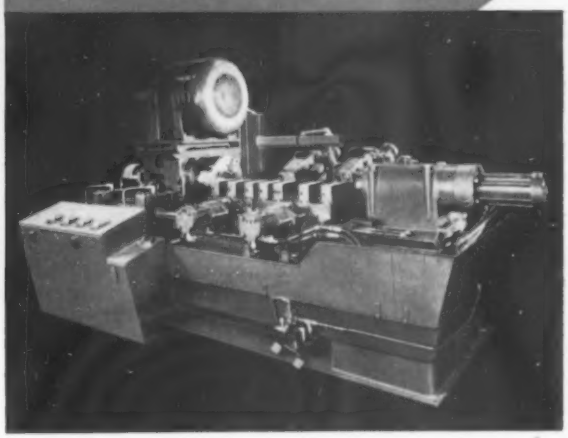
ROUGH TURNING TANK SHAFTS

Quickly and Conveniently on the

SPARKS

Semi-Automatic Hydra-Feed

MANUFACTURING LATHE



Versatility of tooling, heavy rugged construction and ample power adapt the SPARKS to a wide range of turning operations.

Typical of the kind of work that can be handled on this machine is the rough turning of shafts used in the production of tanks. This job involves the turning of five different diameters on a shaft of 44" long having an average diameter of 5½". Tool set up is such that four diameters are turned with 8 front tools, one diameter and a facing operation by one back tool and two facing jobs on a flange by two back tools.

This machine is a standard SPARKS lathe equipped with a carriage 42" wide and a 9' bed. There are two individual back slides for the back tools. In regular service in a leading tank plant, this machine is proving its high production rate and ease of operation.

Note the ample chip clearance which is a most desirable feature particularly where heavy cuts are involved in rough turning.

MODERN FEATURES EXTEND UTILITY

The long-lived accuracy of the SPARKS together with its wide range of tooling possibilities assure high value in this machine as a time and cost cutter for post-war producton requirements.

Equipped with 4-speed ball and roller bearing headstock, hydraulically operated clutch and brake and with hydraulically operated chuck and tailstock, the SPARKS Manufacturing Lathe can be depended on for maximum productivity with minimum effort on the part of the operator.

WRITE FOR COMPLETE DETAILED SPECIFICATIONS

SPARKS HYDRA-FEED LATHE

SPARKS MACHINE TOOL CORPORATION
NORWALK . . . . . CONN.

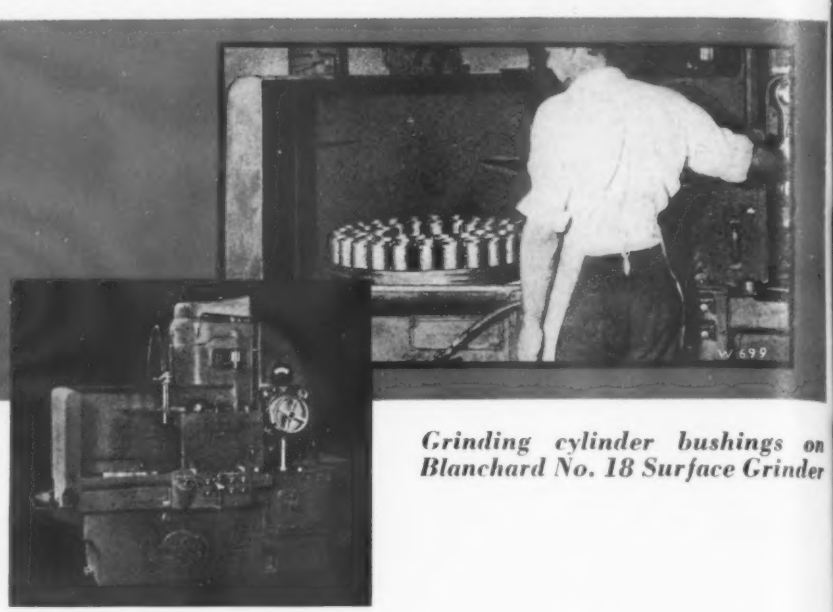
"PUT IT ON THE BLANCHARD"

BLANCHARD

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

- ★ **Production**
- **Adaptability**
- ★ **Fixture Saving**
- **Operation Saving**
- **Material Saving**
- **Fine Finish**
- **Flatness**
- ★ **Close Limits**

★ . . . . . *Especially valuable on jobs like the one illustrated.*



Grinding cylinder bushings on Blanchard No. 18 Surface Grinder

THESE cylinder bushings, 3½ inches high by 3½ inches in diameter, are of extremely thin section, yet they are held securely on the Blanchard No. 18 magnetic chuck. These bushings are Gunite castings. .006″ of stock is ground off both ends to limits of ±.0005″ for size, and .0005″ for parallelism. 50 pieces (100 surfaces) are ground per hour.

Multiple chucking and grinding on the Blanchard is the sure and economical way to machine parallel surfaces on parts such as these, also on collars, gear blanks, and washers.

The Blanchard Magnetic Chuck is so adaptable to holding a wide variety of work that it takes the place of many expensive fixtures that would be necessary on other types of machines.

The BLANCHARD MACHINE COMPANY

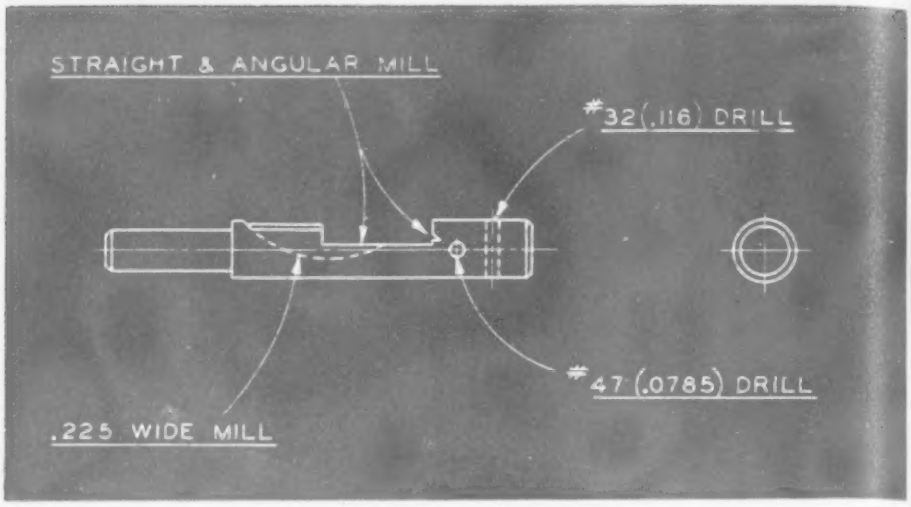
64 STATE STREET, CAMBRIDGE, MASS.

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

SELLERS machine tools were developed to help build this Republic. Their present preoccupation with War production is to help preserve the Republic. When peace comes with Victory, Sellers tools will take up their unfinished job of building, not only this Republic, but a new World.

Sellers

WILLIAM SELLERS & CO., Inc.
Philadelphia Penna., U. S. A.



THIS IS A

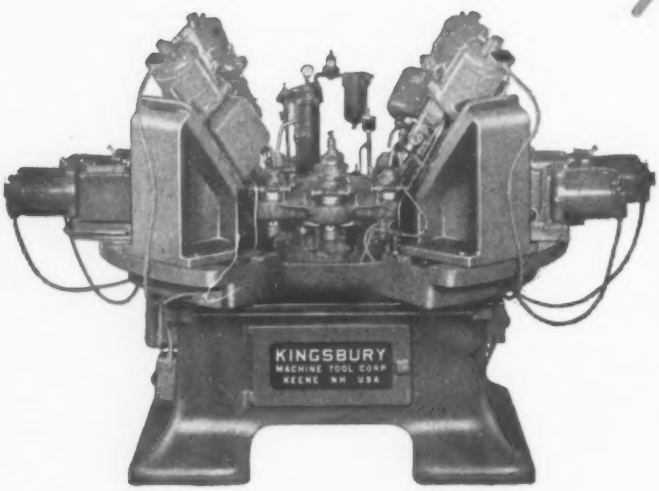
FLEXIMATIC

SMALL ARMSJOB!

Turning out rifle bolts to exact specifications under a fast production schedule

FLEXIMATIC

by KINGSBURY



Many vital needs of armament production are being met with FLEXIMATICS—the machines which perform a wide variety of machining operations in a single chucking of the work.

The Model GD FLEXIMATIC shown here performs various drilling and milling operations on rifle bolts —a job that calls for the highest in both precision and production.

Contributing to the accuracy of the operations performed on this FLEXIMATIC is the mounting of milling spindles on Timken precision bearings. Further safeguarding of accuracy is achieved through driving each spindle by a cone worm and worm gear and dampening vibration by means of a heavy flywheel.

FLEXIMATICS are ideal for all classes of armament production where high accuracy and fast production with unskilled labor are every day conditions which must be met. FLEXIMATICS can, therefore, be depended on to make outstanding production contributions to National Defense.

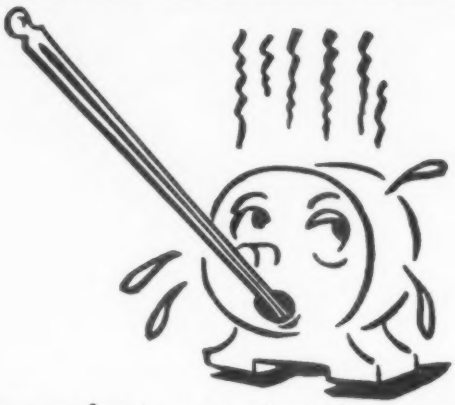
Write today for illustrated Bulletin showing a number of different set-ups.

KINGSBURY MACHINE TOOL CORPORATION

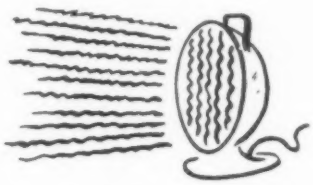
KEENE · NEW HAMPSHIRE · U S A

Motors Run a Fever?

No wonder if they do more often today. They're working 3 and 4 times as many hours a year as in peace!



When a motor runs hot in your plant, do your men have explicit directions for locating the cause? If not, send in for your free copy of "Guide to Wartime Care of Electric Motors". Its QUICK DIAGNOSIS OF MOTOR AILMENTS is invaluable!



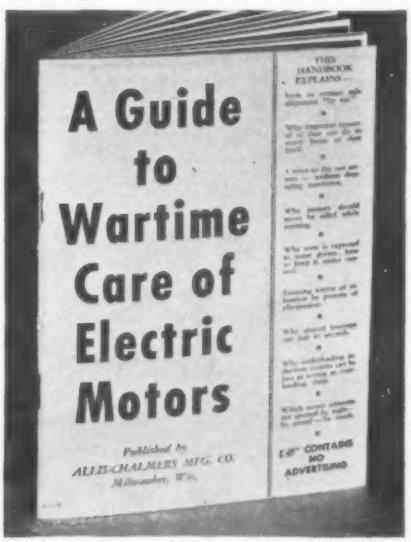
Friction makes heat — and so does electrical resistance. Pages 8 and 9 of Allis-Chalmers' new book tell how wartime preventive maintenance should fight friction . . . pages 16 and 17 outline strategy for preventing overload. Recommendations are simple, practical, *geared to wartime* — ideal for training.

Insulation is "fried" by excessive heat — bearings burned out — soldered connections melted. Play safe . . . put Allis-Chalmers' new motor maintenance guide to work protecting *your* motors!

HERE'S the arithmetic of the wartime motor maintenance problem: motors that worked 1800 hours in a peace year now work up to *8700 hours!*

A killing schedule—yet motors now must last *longer* than ever before — and wishing won't make it so.

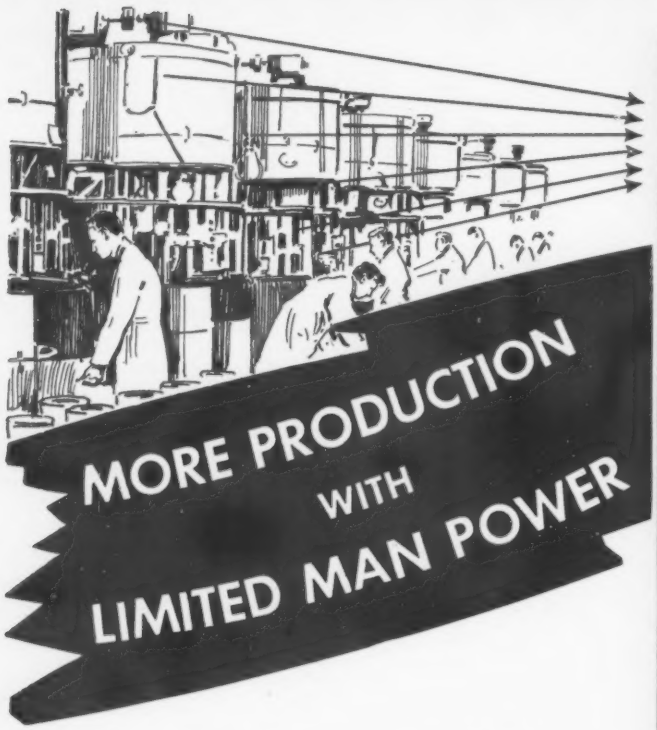
One thing will: the new *wartime* standard of motor care set forth in Allis-Chalmers' new motor maintenance guide. Already, 70,000 copies are in use in plants all over the U. S.!



Contents of this valuable new publication include the 9 main enemies of electric motors and how to fight them . . . dust, stray oil, moisture, friction, misalignment, vibration, uneven wear, overload and underload. Send in today for *your* free copy to ALLIS-CHALMERS, MILWAUKEE, WIS. A 1591

ALLIS-CHALMERS

WE WORK FOR VICTORY — WE PLAN FOR PEACE



Production Control with MINIMUM CLERICAL WORK provided through VISIBLE FILING of ORIGINAL FACTORY RECORDS

The demand for more production when selective service is taking many of the most productive employees for our armed forces is a tough management problem that must be solved. McCaskey Production Control systems can help—are helping with war production in numerous plants.

Through the rapid filing of multiple copies of original factory records, McCaskey provides charted control visualizing every essential step from production planning to final operations or assembly. Up-to-the-minute supporting data, essential for quick decisions, are available at a glance. Posting of numerous records is totally eliminated. Cost and payroll data also are provided without repeated clerical operations.

A McCaskey representative, qualified by training and experience, is available to help you work out simple but effective controls for your specific requirements. Controls that will enable you to step up and maintain production under the handicap of manpower shortage. Call him in. No obligation, of course.

TYPICAL NEEDS SATISFIED BY McCASKEY PRODUCTION CONTROL

. . . Flow of finished parts coordinated to avoid assembly delays resulting from missing units.

. . . Progress record showing immediate status of any or all orders at a glance.

. . . Forecast of production delivery.

. . . Overdue orders eliminated or under control.

. . . Machine scheduling, departmental machine loads and job assignment to keep all machines busy all the time and run jobs in proper sequence.

. . . Check of machine production to assure realization of production standards.

. . . Production follow-up without dependence on stock chasers.

. . . Day to day cost and payroll data for immediate control of unexpected increases.

. . . Unified control of inventories of material, purchased parts, parts produced, sub-assemblies, tools, supplies, etc.

. . . Tool crib control providing more production with less tools.

These typical requirements suggest in general what may be accomplished through McCaskey. Although the specific needs of plants and departments differ, the flexibility of McCaskey Production Control makes it adaptable to practically any of the severe production conditions existing today. You name yours and McCaskey will satisfy them.

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Ontario, Canada — *The McCaskey Register Co., Watford, England*

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

A Legend COME TO LIFE

The short slow steps of regular progress in machine and product development have lengthened to ground covering strides. It's as though some magic means had enabled industry to traverse time just as the legendary seven league boots quickly carried their wearer across great distances. Machines and methods which would not have appeared normally until 1960 are smashing production records now, in 1943.

Clearing Presses stand high on the list of the tools used to fashion industry's seven league boots. In the past few years, Clearing has solved many a key-problem of faster production. Unsurpassed engineering skill and production facilities have time and again combined to do jobs which "couldn't be done."

This same kind of thinking, skill and facilities can help you today to solve your production problems of the future. Clearing has the knowledge, the experience, and the proved ability to produce machines to do things which machines have never done for you before.

Airplane bulkheads are formed accurately and speedily by this 3,000 ton Clearing Hydraulic Press at the Curtiss-Wright Missouri plants. Four cars with this type of Clearing Press permit uninterrupted feeding.

CLEARING MACHINE CORPORATION
6499 W. 65th St., Chicago, Illinois

CMC CLEARING

FOR SHAPES OF THINGS TO COME

CLEARING

MECHANICAL AND HYDRAULIC PRESSES

GREAT GUNS GET A BETTER FINISH!

Photo by
ffice of War Information

SUNOCO EMULSIFYING CUTTING OIL

improves finish . . . cuts cost . . . on grinding operation at gun plant

With so much depending on them, American guns have *to be good.* They are! On the far flung battle-fronts of the world, rifles and tommy guns, howitzers and 16 inchers produced in American factories are proving to be without equal.

One contributing factor in making possible the nth degree precision of these guns is Sunoco Emulsifying Cutting Oil. For example, one large plant was having trouble with the finish of its gun parts. At the suggestion of a Sun Oil Engineer—one of those well-known Doctors of Industry—a change was made in the coolant on the grinding operation. One part of Sunoco Emulsifying Cutting Oil was mixed with 45 parts of water and tried on one machine. Improvement in finish was so marked it could be seen with the naked eye. Immediately Sunoco was adopted for all machines using a soluble cutting oil . . . and besides getting better finish, the company saved nearly 50% in cutting oil cost!

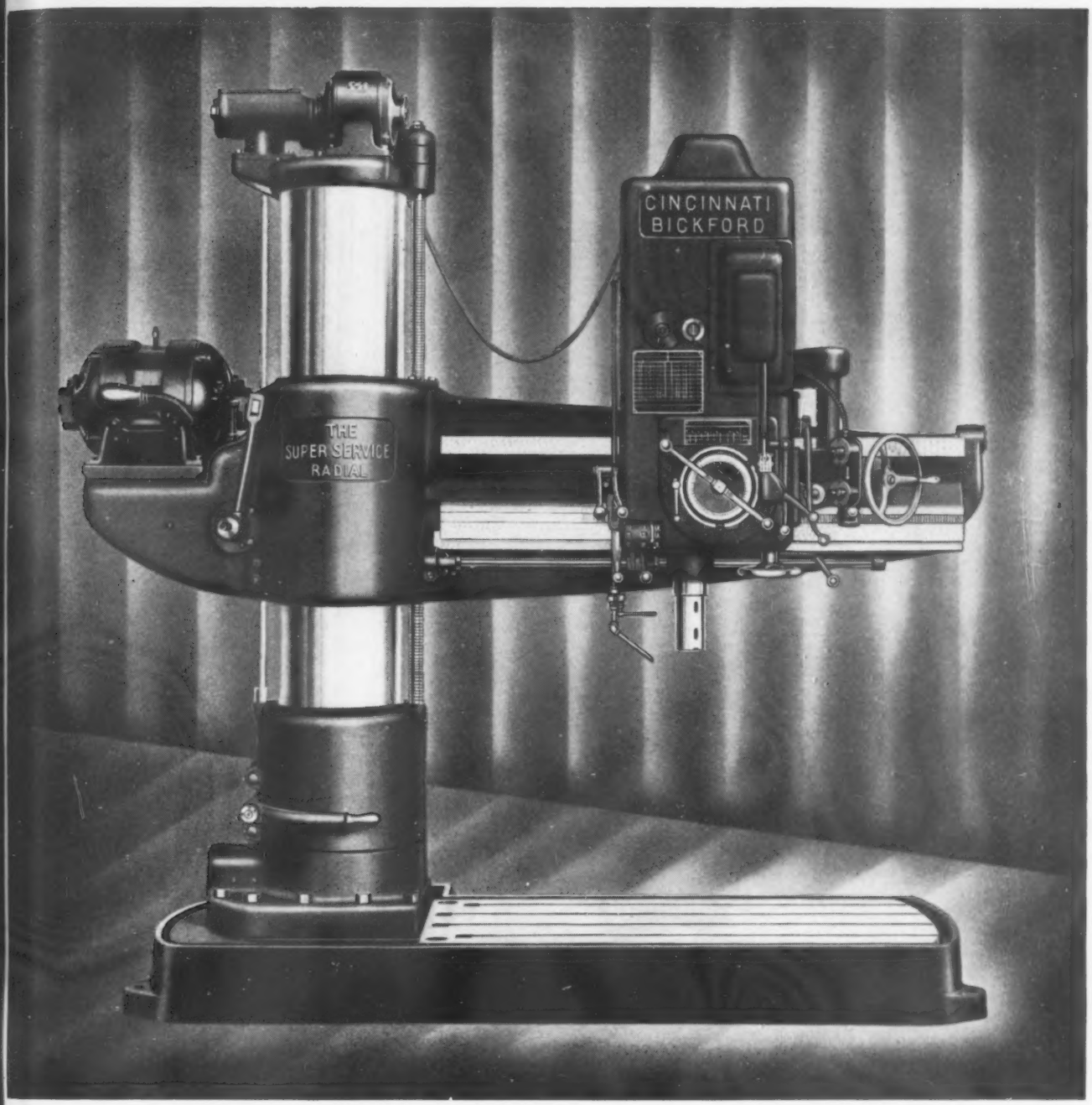
That's typical of how Sun Oil Engineers and Sunoco Emulsifying Cutting Oil are helping the metal working industry in its tremendous war effort. Prove Sunoco's production-boosting merit in your own shop . . . under your own conditions. Write

SUN OIL COMPANY • ***Philadelphia***
Sun Oil Company, Ltd., Toronto and Montreal, Canada

SUN PETROLEUM PRODUCTS

SUNOCO

HELPING INDUSTRY HELP AMERICA



SPEED *and* DEPENDABILITY

are required on all fronts of a truly all-out effort for victory. Production lines must keep pace with front lines. Our front line can only stay ahead of the enemy with the best of men and equipment. Likewise, production must keep ahead of schedules with the most efficient men and equipment. For your drilling department the Super Service Radials are available in sizes from 3' to 8' arms and the Super Service Uprights in 21", 24" and 28" sizes.

AWARDED SEPT. 10, '42

THE CINCINNATI BICKFORD TOOL CO.

OAKLEY · CINCINNATI · OHIO · U.S.A.

WAR SERVICE BRINGS OUT *its* EXTRA CAPACITY

The general superintendent of a plant now on war work remarked to one of our representatives:

"This war effort has given us a real chance to learn about the production rates of our machine tools. Now, with the close tolerances and fast production demanded by the various governmental agencies, we find that Warner & Swasey stands out head and shoulders in our turret lathe department." .

Yes, under war pressure thousands of Warner & Swasey turret lathes are being worked continuously, 24 hours a day, month after month, without breakdown or time out for repairs. In this emergency of high speed production on precision work, Warner & Swaseys are given full opportunity of proving they can turn metal better—and faster.

And when war against the Axis ceases, there will be another "war period"—a war against unemployment, lower standards of living, and enormous per capita debt,—another "war" which can only be won by production! In that period it will be our challenge to design and build turret lathes that will out-produce the turret lathes that today seem to be the last word.

WARNER & SWASEY FOR VICTORY

YOU CAN TURN IT BETTER, FASTER, FOR LESS . . . WITH A WARNER & SWASEY

WHAT'S IN THIS ISSUE

J. R. PORTER

TOOLING-UP FOR PEACE

The machine tool industry is in the un-enviable position of having created a Frankensteinian monster which may, when the end of the war signals the beginning of the slow climb back to normalcy, turn and rend its makers. Unless properly handled, the huge numbers of machine tools produced for the war effort may well stagnate the market and bankrupt and destroy many of the companies which today work around the clock to produce them. J. R. Porter, chairman, Marshall & Huschart Machinery Company, suggests a specific plan to dispose of these machines. AMERICAN MACHINIST editors, expecting this article to stir discussion, invite the submission of alternative plans. Page 97.

PROGRESSIVE HYDRAULIC DIES

A self-contained hydraulic system operates the pressure pad and pressure rings of a 1,400-ton Clearing press drawing rear brake drum webs for Chevrolet trucks. An air-loaded accumulator built into the die applies pressure for the hydraulic system. The manner in which this arrangement works is described by Herbert Chase. Page 89.

SHOP SHOTS

In a pictorial spread with accompanying captions, various production-facilitating methods are presented. A newly developed tool which makes possible the angular setting of a lathe compound rest with sine bar accuracy is pictured and described. Armature baking in one-third of normal time by use of infra-red radiant drying lamps is illustrated. Portable stock tables designed to aid and reduce fatigue of hydraulic press operators, are shown. Page 92.

YEAR'S SAVINGS BUY PLANT

With 99 percent of its personnel drawn from surrounding farms and villages and trained to operate machines producing shell forgings, the Gadsden, Ala., ordnance plant of the United States Army in one year won for itself an "E" burgee, cut production cost and sharply reduced materials usage. It is estimated that in this one year of operation the total derived savings on the contract will be equal to the entire cost of the plant. This record has been attained with a great majority of unskilled workers, practically the only men with previous training being the toolroom workers, most of whom are trade school graduates. The production line methods, salvage program and training procedures that have gone far to make this record possible are described by Walter N. Howley, president, Lansdowne Steel & Iron Company, operators of the ordnance plant. Page 101.

GOOD ADVICE ON MAGNESIUM

Because magnesium is easy to machine, too many shops use tools ground with angles and clearances standard for other metals. Although this causes little difficulty, good finish, reduction of fire hazard, and production economies can best be obtained by using tools ground specifically for cutting this metal. A. M. Lennie, Dow Chemical Company, gives recommended machining practices. Page 86.

TO SPEED THE VICTORY

A change from hand to machine finishing saves 2,500 man-hours a year in the production of torpedo tube flanges.

A single clamp to replace the C-clamps and steel plate normally used in holding a templet during precision filing, has been devised. A single motion will clamp or unclamp a templet to the contour plate, fewer changes in position are necessary, less marring occurs and the templet need not be washed after filing. Using this device reduces set-up time as much as 623 percent. The manners in which these changes have been made constitute but two of the six War Winning Suggestions published in this issue. Page 96.

W. E. LANDIS

WOMEN COUNSEL WOMEN

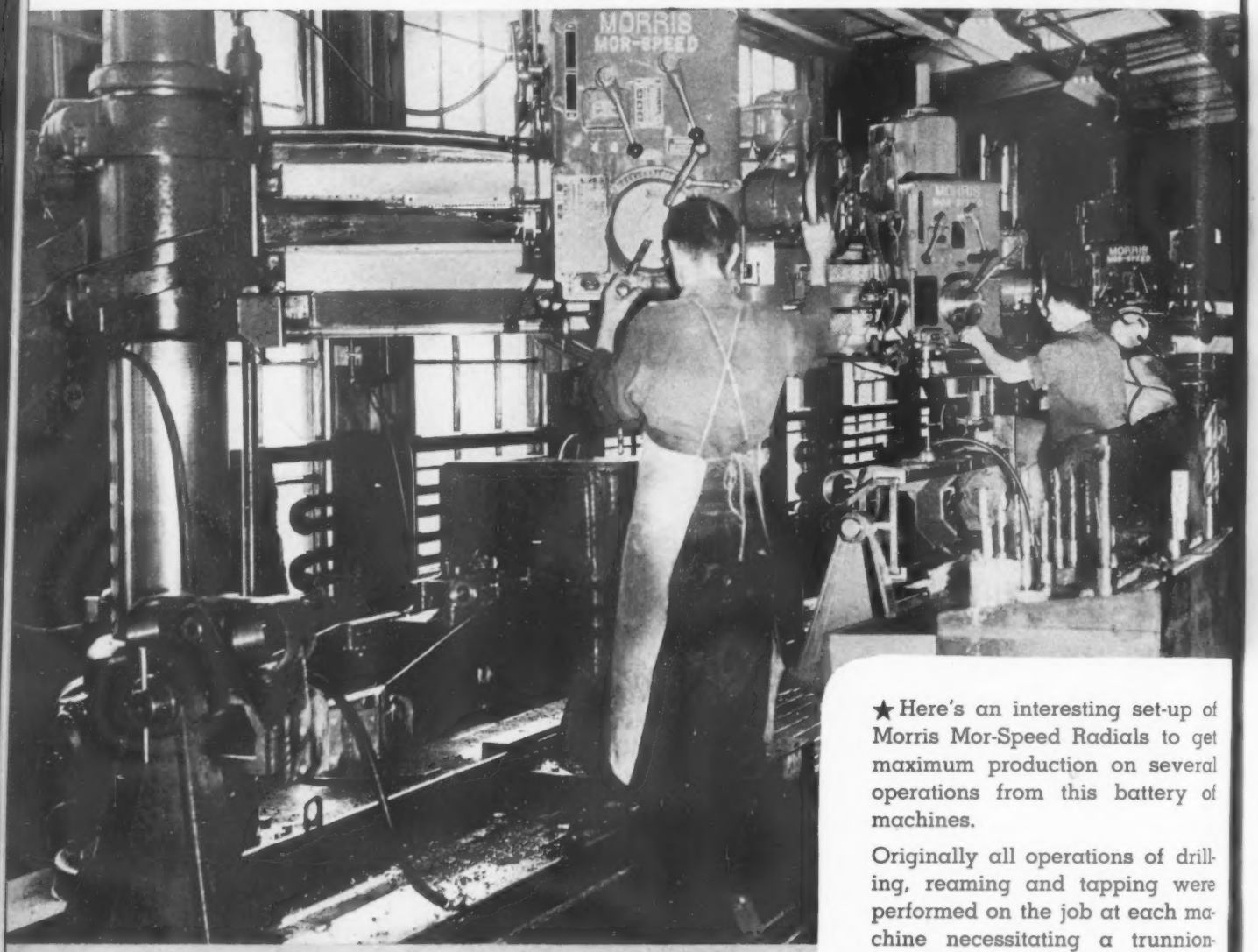
A staff of trained, mature women at the Briggs Manufacturing Company aid new women employees in adjusting themselves to industrial life. Established on a purely voluntary-use basis, women workers are urged to utilize the service whenever time permits and for the solution of whatever problems may beset them. The manner in which this program was set up and the success with which it has met are described by W. E. Landis, assistant director of Industrial Relations, Briggs Manufacturing Company. Page 83.

COMING

One of the largest plants devoted to the production of automatic weapons is located in Canada. Here are produced cal. 0.550 Boys anti-tank rifles, Bren and aircraft-type Browning machine guns. The procedures and methods used to manufacture and assemble the 78 principal parts of the hard-hitting anti-tank rifle, working at all times to close limits of dimensional accuracy and surface finish, will be described in an early issue.

Though the John Inglis Company has behind it 84 years of experience in the construction of a wide variety of steam engines, boilers, and heavy machinery and equipment, the triple-expansion vertical marine steam engines to power the Liberty ships are the largest it ever produced. A number of improvizations have been necessary to increase the capacity of certain of the machine tools to permit finishing some of the large castings. The details of these changes will be described in a soon-to-be-published article.

Synchronized for Production



A BATTERY OF MORRIS MOR-SPEED RADIAL DRILLS

★ Here's an interesting set-up of Morris Mor-Speed Radials to get maximum production on several operations from this battery of machines.

Originally all operations of drilling, reaming and tapping were performed on the job at each machine necessitating a trunnion-type fixture, cutting tools and jig plates for a complete job at each machine.

Dividing up the operations among the radial drills set in line beside rails carrying wheel mounted trunnion fixtures not only saved precious operating time but substantially increased production.

For more speed—continued accuracy—high production—investigate Morris Mor-Speed Radial Drills. Ask for full descriptive bulletin for complete details. Standard sizes — 9" — 11" — 13" column.

FRATT & WHITNEY exclusive sales representatives for the U. S. A.

Builders of MOR-SPEED Radials

The MORRIS Machine Tool Co.

CINCINNATI, OHIO

WOMEN from all grades of society are flocking into our war plants. How are their civilian lives to be rearranged to fit industrial existence? A large auto-body manufacturer has found an answer in a counselor service founded on mature, intelligent women working on a sympathetic level with the girls in the plant

Counselors Aid New Women Workers

BY W. E. LANDIS, INDUSTRIAL RELATIONS, BRIGGS MANUFACTURING COMPANY

AN EXPERIMENT in the use of talented women as counselors to female employees has been under way at the Briggs Manufacturing Company since December. Stationed in the plants of the Detroit concern, after careful selection and training, these women counselors help the new woman war worker with her personal problems during adjustment to industrial employment.

The idea of women counselors in industry is not new. They have been employed by various enterprises during peacetime, but no need existed for them in most automotive plants under pre-war conditions. In their body-manufacturing days, for example, Briggs used only about 1,500 women, and these could be classed as experienced factory workers. To handle its aircraft commitments, the firm has already hired 6,500 women, and eventually will employ 16,000. Drawn from all walks of life, these new workers have personal problems that must be adjusted by competent advisors if morale, morals—and production—are to be maintained.

Before introducing the counselor service, the industrial relations department discussed the need for it and the method of operation with management and union. To both groups, it said:

"After induction, the woman war worker may use this service or not, as she sees fit. The counselor will not be assigned to a manufacturing department; she will not circulate through the factory seeking to be of service. In effect, she will provide a consulting service (in a private office) to those who come to her. She must make good in the plant as the result of her own common sense and tact.

"If situations arise in which the management and union both have an interest, she is expected to take a middle of the road position. Details of specific cases are not to be reported to the company—only such trends as require notice by company or union, either separately or through cooperative action."

★ ★ ★

Union officials and management agree the counselor plan helps to work out moral, morale and production difficulties caused by the influx of women workers. Well-guided new employees work better, live happier

★ ★ ★

Put on this basis, union stewards accepted the plan. Moreover, they agreed with the industrial-relations department that plant morals standards must be maintained so that their own wives and daughters can work with satisfaction at Briggs, if need be.

Plant managers accepted the proposal because it promises to relieve supervisory personnel (much of which is in training too) of distractions caused by worker complaints or problems. The industrial relations department considered stationing counselors in first-aid departments, but in several instances the plants have provided separate office quarters in recognition of the services already performed.

Counselors are chosen from applicants with varied education, attainments and experience, so that the group as a whole can bring richly diversified viewpoints to the problems arising. Social workers, mothers of grown families, registered nurses, women of high scholastic attainments are found in the first group of eighteen counselors. In all cases counselors

are married, possess a mature viewpoint, exceptional personality, and some qualification to assume leadership.

Before being stationed in plants, counselors were given six weeks of intensive instruction in company policies and functions of the various divisions and departments. The first two weeks were given over to instruction by department heads, right on the spot, in the theory of departmental operation and application of company personnel policies. The next three weeks were spent in these departments studying the daily application of company policy as matters came up.

Reports Show Aptitudes

In the last week of the course, the counselors wrote a report on what they had learned. They were free to revisit any department to refresh their memory or check details on how actual problems were or should have been handled. These reports, written as they were by intelligent persons with a fresh viewpoint, proved of genuine interest to management, in addition to proving whether the applicant had made the grade. This course of instruction proved that a housewife will make just as good a counselor as a professional woman, provided that she possesses the basic prerequisite—common sense.

When in the plant, the counselor has two prime functions: the induction of new workers, and the handling of cases brought to her by workers of their own initiative.

Induction of new workers is a most important function, even though most job seekers have been processed in the company training schools. Groups of six to ten inductees are sent to the plant throughout the day for induction before being placed on the proper shifts. The women come to the counselor's office for an informal ten-minute talk on the reasons for and importance of observing factory safety rules, of wearing suitable clothing (attractive slacks are provided at cost), of being on time and avoiding absenteeism, and of sticking to the assigned shift. The last requires emphasis, especially with workers new to industrial life.

"Quits" and a comparable loss in training effort are largely avoided through pre-selection of workers for shifts and training them during assigned shift periods. Thus, the prospective worker is broken-in to a change in normal habits at the outset, which weighs the scales in favor of actually keeping the employee when placed upon production. Furthermore, attendance at the training school in the assigned shift period proves that a common excuse for refusing the production shift—by reason of alleged transportation difficulties—is not valid.

Introducing the Employee

After talking to the group of inductees in her office, the counselor takes them to the time clock and lockers, points out the first-aid and comfort facilities, and finally introduces each person to her superintendent and foreman. This treatment makes each inductee feel that she is an individual, that the company is interested in her welfare, and lessens her bewilderment on being introduced to industrial surroundings.

In her carefully worded talk to inductees, the counselor invites them to bring their personal problems to her at any time they can. They are advised that their insurance will be transferred from the training school to the plant in which they are now working, and that within a few days they will receive details of how to seek share-ride companions or a driver. Assistance with questions on such matters is invited. Production workers are paired to avoid conflicting personalities, though later conflict may bring a request for aid.

Needs of New Workers

The needs of the new woman war worker are many and varied, both in respect to her life within the plant and outside. Women with children seek help in finding day nurseries or boarding schools. Many new workers are wives of soldiers and have come from a distance, so that they require help in locating accommodations. Rather than let such problems be solved upon a catch-as-catch-can basis by supervisors burdened with other matters, Briggs chose to establish a well-trained corps of women who would enlist the good will of new workers as well as the nucleus of experienced factory employees.

The practice of letting workers come voluntarily to the counselor's office, rather than seeking out problems or complaints in the plant, has definite

New employees are introduced smoothly into shop routine by trained counselors, like Buelah Christianson, who tell them about company rules, show them work- and washrooms and other plant facilities, and introduce them to their foremen

Individual problems can be discussed in private in voluntary interviews. Here Lucille Kammerer answers Mary Ketchie's questions about continuing group insurance started while in training

advantages. First, the counselors maintain a disinterested point of view; they don't become paternalistic. Second, union stewards know that the counselors are not spies. Third, by word of mouth the news spreads among workers that they can get a large measure of competent advice for the asking, that a ready ear is available for problems or complaints that they would not care to discuss with either the male foreman or union steward.

Briggs has not set any rule for the number of counselors it will employ, or the ratio of women war workers per counselor. Seemingly, it may be necessary to have two counselors available in each plant on each shift. What the final number will be rests upon the volume of "referrals," or cases, that come up. It is significant that both supervisors and union stewards have sent many women to the counselors.

As the program gets further along, the industrial relations department expects the counselor plan to provide down-to-earth facts on what the employment of thousands of new women workers actually entails in regard to company policy and working conditions. The plan is expected to help with outside problems that may mean the difference between full working crews or faltering production.

The plan boils down to this: Briggs is looking for new trends in industrial relations, so that prompt action will maintain the firm's reputation as a good place to work, and war production will reach the total planned. In its group of women counselors, the firm believes it has an impartial fact-finding group that will ease the day-by-day problems that are bound to occur when eventually 50 percent of the factory payroll is drawn from a group of women who have not worked before in industry. How company policy must be changed or broadened to meet the new conditions, Briggs can't say yet. But from looking at the 6,500 workers who have already joined the company's war effort, the industrial relations department surmises that the new program will more than pay for itself in higher production and more contented employees.

Cutting Tomorrow's Corners

Two welding rod manufacturers in Canada have been cooperating in a scheme to save approximately 15 percent of the metal now used in producing electrodes. Rather than follow standard practice of grinding the flux off one end of coated rods, leaving bare metal for gripping by the electrode holder, these companies have agreed to leave the rods coated for their full length, and advocate the use of a permanent projection on the holder to which the electrode can be butt welded. The full length of a welding rod can thus be used. If adopted in this country, one large company now using 250,000 lb. of electrodes monthly would reduce its requirements 37,500 lb. At 6 cents a pound, $2,250 would be saved every 30 days. That's $27,000 annually. Not bad!

✦

Liquid nitrogen, 410 F. below zero, is being used to shrink steel parts needed in the manufacture of wartime equipment and electrical apparatus. The shrinkage allows a diameter clearance of slightly less than 0.002 in. between the parts. The liquified gas is poured into an open container surrounded by dry ice, and the part dipped in it.

✦

Much development work took place last year in the process for arc welding in atmospheres of inert gases such as helium and argon. It is commercially applied to the welding of magnesium, aluminum and the stainless steels. The inert gas surrounds the arc, protecting the weld from the air until fusion is complete.

✦

The common practice of using separate light and power circuits of 120/240 and 480 volts, respectively, is being eliminated in some plants. With the development of modern high-level illumination—especially that utilizing flourescent lamps at high voltages—general area lighting is now placed directly on the 480-volt power circuits. This has reduced the quantity of copper required for the low-voltage distribution system by one-third, and has resulted in lowered cost since 480-volt distribution systems are less expensive that 120/240 systems.

✦

The fluid drive is likely to find other uses than in the automobile. In fact it is already being used as a cushion coupling in large blowers. The Germans are said to be using it in locomotives as well as in airplanes for driving the supercharger. We are also using it in the latter capacity. But its application to machine tools is something to conjure with — several have already been made. One is a very simple method of changing the oil capacity to the driven member, thus varying the torque transmitted to the cutting tool. This is still experimental. But its something that may develop and mark a step forward in machine building.

Grind Cutting Tools Properly

Special attention should be paid to relief and clearance angles, sharpness of cutting edges, and finish of tool faces. By following the recommended practice, high quality machine finish and production economies will result

BY A. M. LENNIE, DOW CHEMICAL COMPANY

MAGNESIUM and its alloys have excellent machinability. Good surface finish and dimensional accuracy are obtained with light and heavy cuts at both low and high cutting speeds. The limiting factor on cutting speeds for these alloys is the capacity of modern machine tools. As shown in Table 1, the power required to machine magnesium is about one-sixth of that required to machine mild steel.

The low temperatures and pressures developed in machining magnesium allow a wide latitude in the choice of cutting tool angles and material. Therefore, standard tool shapes used for cutting steel and brass can be used for magnesium alloys. For optimum results, however, they should be modified somewhat because the high coefficients of thermal conductivity and expansion of magnesium require that special attention be paid to relief and clearance angles, finish of the tool faces, and the sharpness of cutting edges.

Use Large Relief Angles

Relief angles larger than normally used will prevent any rubbing of the tool flanks on the work, thus minimizing adhesion of chips to the tool.

Rake angles may be large if desired, but the best results based on tool life and chip formation are obtained if these angles are held between 0 and 15 deg.

End and side cutting edge angles are best determined by the prerequisites of the individual job. Extremely large side cutting edge angles should be avoided to eliminate the possibility of chatter.

Drills, taps, reamers and milling cutters must have increased chip space to prevent jamming of chips produced by the high feeds and deep cuts used when machining magnesium. Reamers should be ground slightly oversize to allow for "spring back" of the metal—this compressibility effect is minimized in tapping by using larger rake angles and by the cutting action provided by the heel rake angle when backing out the tool.

Keep the Tools Sharp

Finishing cutting tools with a fine (100 to 300 grit size are recommended) grinding wheel will give smooth surfaces with minimum friction for the sliding of chips as well as provide a good cutting edge. Honing the cutting tool to a very sharp edge will improve the tool life and surface finish. This practice may also be used to recondition slightly dulled tools. It is recommended that all tools for machining magnesium be ground by a central tool grinding department.

Rigid chucking of magnesium parts is required to avoid chattering or distortion.

While high-speed steel cutting tools can be used on magnesium, it is recommended that cemented-carbide tools be employed, especially in production jobs. The greater abrasion resistance of the cemented carbides results in ten to twenty times longer tool life and better operating economy, especially at high cutting speeds. These tools should not be run to the full extent of their possible life, but should be resharpened when only slightly dulled to maintain sharp edges and conserve tool material. Good tool life can be obtained with high-speed steel, particularly if the hardness and carbon content are kept high.

Under certain conditions, the machining of magnesium presents a fire hazard. If this fact is recongized, and the simple precautions recommended are followed, no trouble will be encountered. The hazard exists only when fine cuts of 0.001 in. or less are taken at cutting speeds of 700 surface ft. per min. or more. Maintenance of sharp cutting tools and the generous use of a cutting fluid will practically eliminate the fire hazard even under conditions most favorable for its existence. A complete discussion of this phase of machining practice will be given later.

Turning and Boring

Lathe set-ups, with due consideration to more rigid chucking of magnesium, are same as for brass or steel with the exception of slight differences in tool design. For best results, turning and boring tools should have a back rake of 0 to 15 deg., a side rake of 0 to 15 deg., and relief angles of 6 to 12 deg. Side and end cutting edge angles may be varied widely to suit the particular job, but exceptionally large side cutting edge angles may cause chatter. Nose radii should be kept small. Wide forming tools should have a back rake of 0 to 8 deg. to avoid chatter. Figs. 1 and 2 show typical high-speed steel tools recommended for roughing and finishing work on magnesium. Carbide-tipped tools may be used with practically the same angles as tools of high-speed steel, inasmuch as the tool forces are not large in machining magnesium. However, in order to support the tip, the rake angles are usually limited to approximately 8 deg. with the rest of the design remaining the same. Recommended angles for carbide-tipped tools are shown in Fig. 3.

A wide range of cutting speeds, feeds and depths or cuts are possible in turning magnesium. For all practical

purposes, any depth of cut may be taken providing the work is of sufficient size and is chucked rigidly. Heavy feeds provide a quick means of removing metal, but do not give the best surface finish. For good finish, using the proper tools, feeds of 0.003 to 0.025 in. are recommended. Extremely fine cuts are to be avoided whenever possible since they tend to heat the work more than heavier cuts. According to American practice, cutting speeds for turning vary from 150 to 1,000 surface ft. per min. on vertical turret lathes, and from 400 to 2,500 surface ft. per min. on engine and turret lathes; speeds up to 5,000 ft. per min. are said to be used in foreign countries. Table 2 presents general recommendations for depth of cut, feed and cutting speed. These are intended only as a guide—the general rule is to turn and bore magnesium as fast as the machine tools, fixtures and work will allow.

Shaping and Planing

Practically the same tool designs and machining recommendations for turning and boring can be applied to the shaping and planing of magnesium. Any necessary deviations from the recommended tool shapes will cause no trouble as long as keen cutting edges and the proper relief angles are used.

Inasmuch as the maximum cutting speeds in these operations are much lower than the optimum recommended cutting speeds, economies must be effected through the use of heavy feeds and depths of cut. The low power requirements make possible the use of heavy roughing cuts. To prevent the possibility of marring the surface on a finish cut, the tool block should be lifted on the return stroke of the ram or table to avoid dragging the tool over the work surface. The rigidity of the workpiece and clamping fixtures as well as the possibility of inducing machining stresses in the work are the limiting factors in maximum possible size of cut.

Milling

Milling operations provide an opportunity to take full advantage of the excellent machining characteristics of magnesium. Slab, side and straddle mills should be coarse toothed with one-half to one-third as many teeth as in mills for steel. Inserted blade face mills with large chip spaces and fly cutters perform exceptionally well on magnesium. Heavy feeds and high milling speeds can be used—they produce good surface finish and minimum heat generation. While high-speed steel can be used satisfactorily on all types of milling cutters, cemented carbides will be found far superior for inserted tooth face mills and fly cutters which operate at very high speeds.

Milling cutters should be designed with rake angles of 5 to 20 deg., relief angles of 20 to 30 deg. for a distance of $\frac{1}{16}$ to $\frac{1}{8}$ in., and clearance angles of 20 to 30 deg. Helix angles in face mills vary from 5 to 15 deg., and in some in-

Table 1—POWER REQUIREMENTS

Metal	Relative power required (1 = lowest)
Magnesium alloys	1.0
Aluminum alloys	1.8
Brass	2.3
Cast iron	3.5
Mild steel	6.3
Nickel alloys	10.0

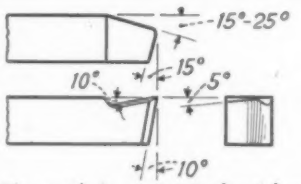


Fig.1-High-speed steel tool for rough turning

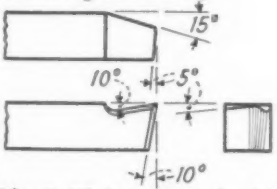


Fig.2-High-speed steel tool for finish turning

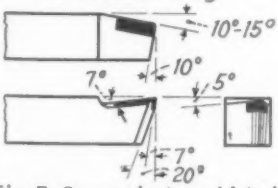


Fig.3-Cemented-carbide tool for turning magnesium

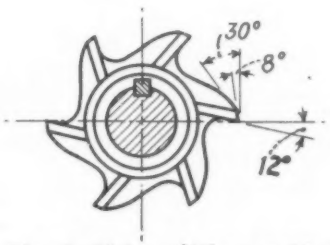


Fig.4-Side milling cutter

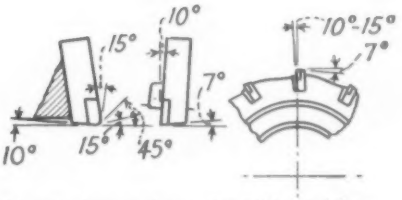


Fig.6-Inserted-tooth cutter

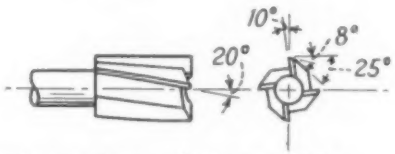


Fig.5-End milling cutter

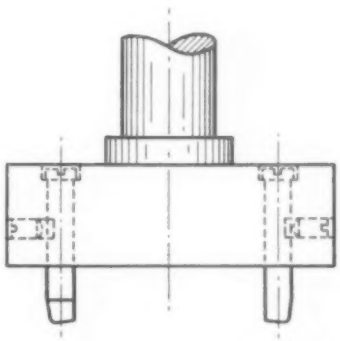


Fig.7-Two-blade fly cutter

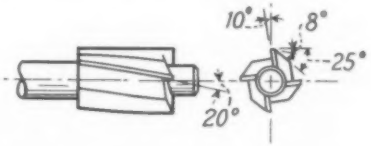


Fig.8-Counterboring tool

Although there is a wide latitude in choice of tool angles and tool materials for turning and boring magnesium, supeerior finish and production economies can be obtained by using these recommended tool angles

Milling cutters for magnesium require from one-half to one-third as many teeth as cutters for steel, since large chip space is required. Fly cutters perform exceptionally well. Counterbores should have rounded corners at the cutting edges. Honing of all cutting tools is highly recommended. Heating of the work can be minimized by heavy roughing cuts and a fine finish cut at surface speeds between 1,000 and 9,000 feet per minute

Table 2—RECOMMENDED TURNING SPEEDS AND FEEDS

Operation	Surface speed, ft. per min.	Feed, in. per rev.	Max. depth of cut, in.
Roughing	300 to 600	0.030 to 0.100	0.500
	600 to 1000	0.020 to 0.080	0.400
	1000 to 1500	0.010 to 0.060	0.300
	1500 to 2000	0.010 to 0.040	0.200
	2000 to 5000	0.010 to 0.030	0.150
Finishing	300 to 600	0.005 to 0.020	0.100
	600 to 1000	0.005 to 0.020	0.080
	1000 to 1500	0.003 to 0.015	0.050
	1500 to 2000	0.003 to 0.015	0.050
	2000 to 5000	0.003 to 0.015	0.050

Table 3—MILLING FEEDS AND SPEEDS

Operation	Surface speed, ft. per min.	Feed—In. per min.	Feed—In. per tooth	Depth of cut, in.
Roughing	to 900	10 to 30	0.005 to 0.025	1/4 to 3/16
	900 to 1500	10 to 30	0.005 to 0.015	3/16 to 1/16
	1500 to 3000	10 to 30	0.005 to 0.010	5/32 to 1/32
Finishing	to 900	10 to 30	0.005 to 0.015	1/16 to 1/32
	1000 to 3000	10 to 30	0.004 to 0.008	1/16 to 0.005
	3000 to 5000	10 to 30	0.003 to 0.006	1/32 to 0.003
	5000 to 9000	10 to 30	0.001 to 0.005	1/32 to 0.003

stances negative helix angles are used to throw the chips out of the cutter. Helical mills should have a helix angle of approximately 45 deg., while end and shell mills should have a helix angle of 10 to 25 deg. Typical designs of milling cutters are shown in Figs. 4, 5, 6 and 7. As in the case with other cutting tools, standard milling cutters may be used, but the precautions regarding sufficient chip clearance and relief angles must be followed for good results.

Cutting speeds from 1,000 to 3,500 surface ft. per min. are standard in most shops, but speeds up to 5,000 ft. per min. are used frequently. In some instances, speeds up to 9,000 ft. per min. have been employed.

Such a wide variety of feeds and depths of cut are possible that only general recommendations based on industrial experience can be made. The depths of cut depend on the amount of stock to be removed, but this can usually be taken down for the finish cut in one pass. Extremely deep cuts may require slower speeds. Feeds depend on the speed of the cutter and type of cut being taken, but vary from 0.001 to 0.025 in. per tooth. At high cutting speeds this means a table travel of 10 to 30 in. per min. As in other machining operations, the low modulus of elasticity must be taken into consideration to avoid distortion when chucking and cutting magnesium. Heating of the work can be minimized by heavy roughing cuts and a fine finish cut at high speed. Mirror-like surfaces can be obtained by following recommended procedures. Table 3 presents a summary of milling feeds and speeds.

Counterboring

Counterbores designed for magnesium should be ground similarly to end mills. The helix angle should be approximately 20 deg. with a margin of about 0.015 in. and a large clearance angle to provide adequate chip space. The rake of the cutting edges will be determined by the helix angle. A relief angle of 6 to 10 deg. should be followed by a clearance angle of 15 to 25 deg.

To minimize stress concentration, sharp interior corners should be avoided when machining magnesium. For this reason counterbores should have rounded corners at the ends of the cutting edges, particularly when used in spotfacing operations. The radii should be $\frac{1}{16}$ in. or more, depending upon the diameter of the cutter. Fig. 8 shows a properly designed counterboring tool for magnesium alloys. As is the case with all cutting tools for magnesium, the cutting edges should be kept sharp and free from nicks at all times.

Filing

Single and double cut files of the coarse, bastard and second-cut types work best on magnesium. Smooth-cut files load up easily but can produce fine finishes if light cutting pressures are used. Chalking prevents loading. For heavy work, where an appreciable amount of metal must be removed, single-cut coarse files with from 5 to 10 teeth per inch and a back rake angle of approximately 10 deg. are recommended.

Rotary files or burrs can be used for cleaning castings and filing irregular surfaces. Best results are obtained from high-speed steel "ground-from-solid" burrs. These should be coarse cut with few cutting edges and deep flutes for good chip clearance. Surface hardening to give increased abrasion resistance is recommended after grinding and resharpening of the burrs. Cutting edges should have a back rake of 5 to 10 deg., and a right-hand spiral of approximately 20 deg. These tools should be operated between 4,500 and 7,000 r.p.m.

Miscellaneous Operations

Magnesium alloys work-harden very rapidly. This restricts the use of any operation such as knurling which involves the cold-working of metal. A slight modification in the design of knurls to reduce the amount of cold-working results in satisfactory knurled surfaces. The knurling tools should be kept sharp and the impressions must be shallower than those used on steel or brass. Single straight toothed, rather than diamond cut knurls are preferred due to the smaller amount of cold-working involved. Outside of these factors, standard procedures can be used.

The machining characteristics of magnesium permit fast and easy operation of hand tools. In some cases these characteristics allow operations which are impractical on other metals. Hand planes and portable milling cutters, used widely abroad but very little in this country, provide excellent tools for clean up and intricate jobs which cannot be done by other means. All types of portable tools such as drills, grinders, buffers, pneumatic chisels and chipping tools can all be used with good results on magnesium alloy parts.

Part 2 of this article will appear in an early issue.

Progressive Die is Oil-Operated

This unique four-plunger hydraulic system supplies the heavy load needed to hold the blank in drawing a rear brake drum web

BY HERBERT CHASE

REAR BRAKE DRUM WEBS for Chevrolet trucks are among the largest and heaviest parts produced in progressive stamping dies by the Chevrolet Gear and Axle plants in Detroit. This part measures 16⅜ in. in diameter and requires a draw of a little more than 2 in. The eight-station die is made in two sections and is set up in a 1,400-ton Clearing press. Production averages 16 finished web stampings a minute. Design of these webs calls for dishing the centers, embossing stiffening ribs in the tapered section and turning the periphery inward at right angles to the plane of the web. The periphery is serrated with 36 equally spaced lugs; when the webs are completed they are used as inserts in molds in which iron brake drums are cast around these serrations, locking the periphery of the web securely to the cast-iron drum for the wheel assembly.

Hydraulic Pressure Pads Used

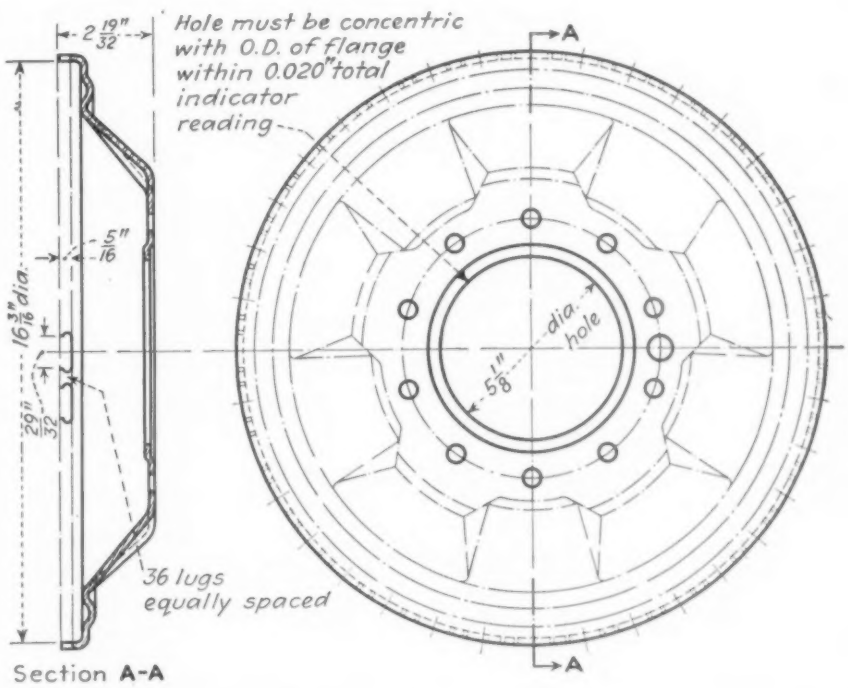
The 20-in. wide strip from which the webs are punched is hard-rolled deep drawing steel conforming to General Motors 1010 analysis, and the drawing for these parts specifies a thickness of 0.156 in., plus or minus 0.008 in. Punching operations at the first two stations of the progressive die cut away some of the metal between stampings in the strip, leaving narrow bands at each edge of the strip stock. These bands are depended upon to carry the stampings forward and to insure registering as the stock is advanced from station to station through the die. The main drawing operation is performed at the third die station. Drawing of the center section of the web is completed at the fourth station, then at stations five and six the still flat periphery is punched to form the required lugs. At the seventh station the periphery is drawn to an internal diameter of 16 3/16 in. to turn the lugs at right angles with the plane of the web center section. Finally, at station eight, ten 3/4-in. holes equally spaced around a 7¼-in. diameter circle are punched, and the 5⅛-in. dia center hole in the rear brake-drum web is blanked.

Of particular interest is the unusual if not unique application of a self-contained hydraulic system to operate the pressure pad at the third station. It is not unusual to operate such pads, as well as stripper plates, with air cylinders, but the pressure required at this station is so great that air cylinders of suitable capacity would be too large for the die. In addition to the hydraulic system for the pressure pad, an 8-in. air cylinder is positioned at station three to operate a small pressure ring, and similar cylinders are employed at other stations. Air is furnished under pressure from the shop lines to operate the various pneumatic cylinders, and to apply pressure to one side of a piston in what is called the "sump" for the hydraulic system. This is, in effect, an air-loaded accumulator that is built directly into the die.

Four hydraulic plungers of 4½-in. diameter operate the main pressure pad at the third station. Cylinders for these pistons are set into the lower half of the die, and the pressure pad is a component of this part of the assembly. Above the pressure pad, in the upper or punch holder portion of the die assembly, is a flattening ring. As the die closes the strip stock at the third station is clamped between the ring and the pad. When the pad and ring contact the strip, the pad is in its uppermost position. It is held up by the pressure of oil in the hydraulic system, the pressure being supplied by air pressure above the sump piston.

Bypass Valves Control Pressures

As the pressure pad is forced downward by the action of the press, the oil below the four plungers is forced out into the sump, raising the sump piston against air pressure on the other side.



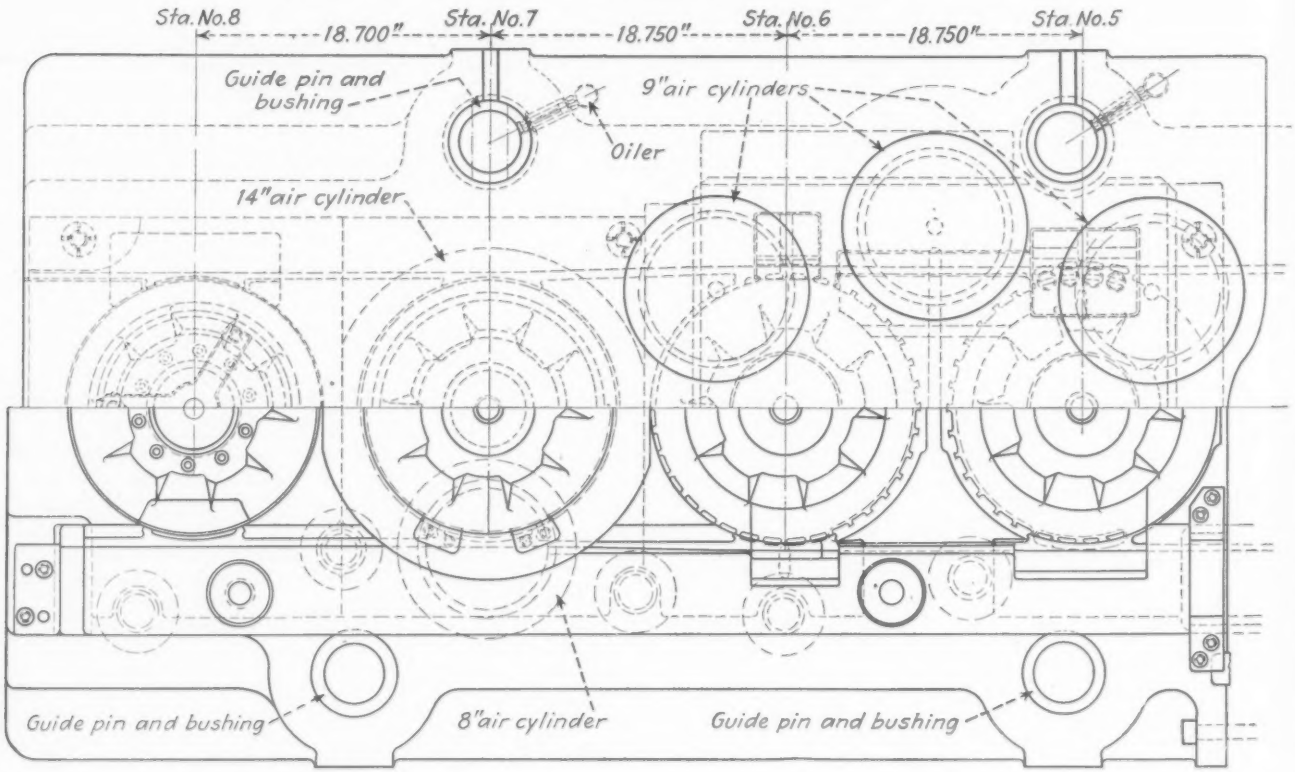
An eight-station progressive die is set up in a 1,400-ton Clearing mechanical press to produce rear-wheel brake drum webs of this type from steel strip 20 in. wide and approximately 5/32 in. thick

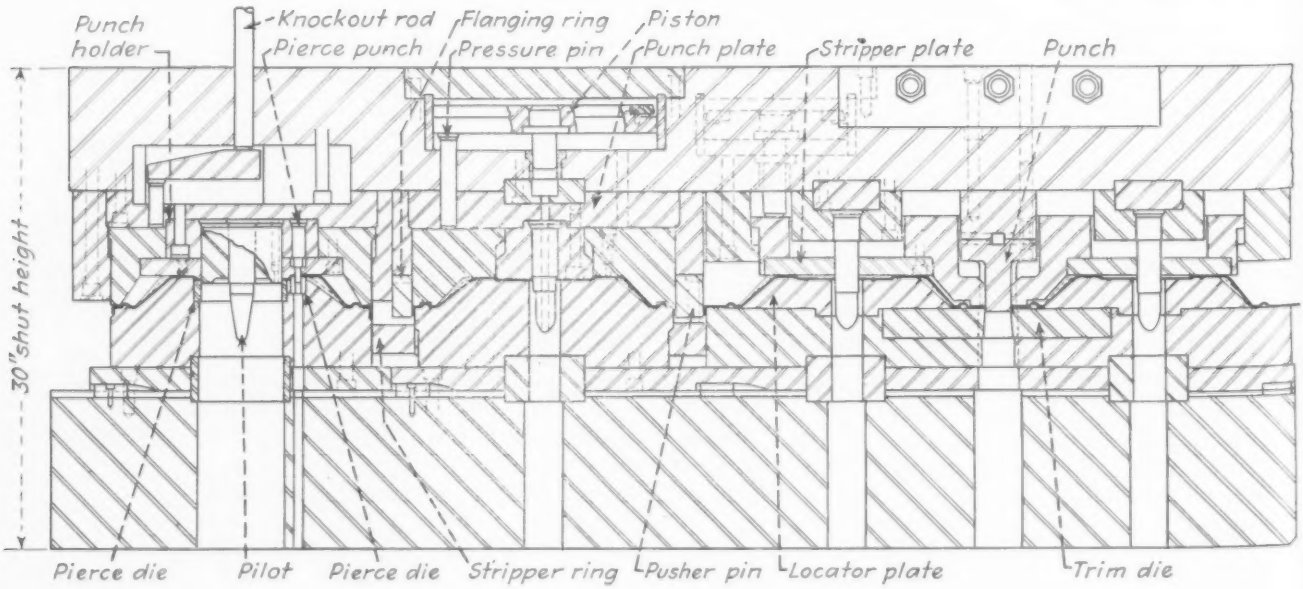
To enter the sump, however, the oil must pass through an hydraulic bypass valve. Spring pressure in this valve is set to open at about 500 lb. per sq. in. Hence the pressure applied by the four hydraulic plungers against the pressure pad must reach this value before oil will bypass into the sump. Spring pressure in the valve is adjustable, in order that the pad pressure can be varied to suit conditions.

When the die opens the pressure pad, still urged upward by hydraulic pressure, lifts the stamping off the forming die. During the upward stroke the air-loaded sump piston forces oil back through the bypass valve. The four hydraulic cylinders are thus kept filled with oil. Some of the passages for the hydraulic system are drilled in the die and others are through external piping in which the bypass valve is connected. All hydraulic and pneumatic cylinders consist of rings set into the cast die blocks, as this simplifies machining, avoids chances of leaks through pores in the castings, and permits renewal should liner wear be excessive.

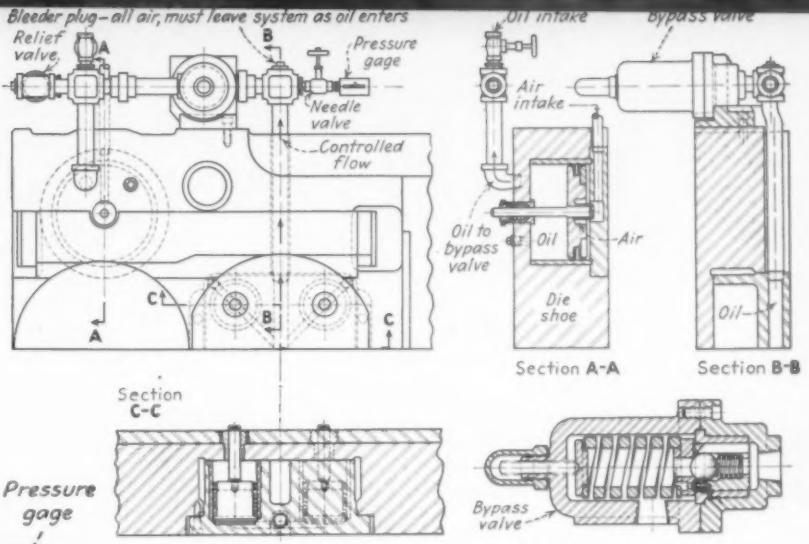
The die is set up in combination with a separate mechanism for feeding the stock between strokes of the press, and a scrap cutter at the other end of the press. Also, there is a swinging pick-off unit at the eighth station to lift the finished piece from the die and drop it into a tote box for transfer to succeeding operation machines which are set up for line production.

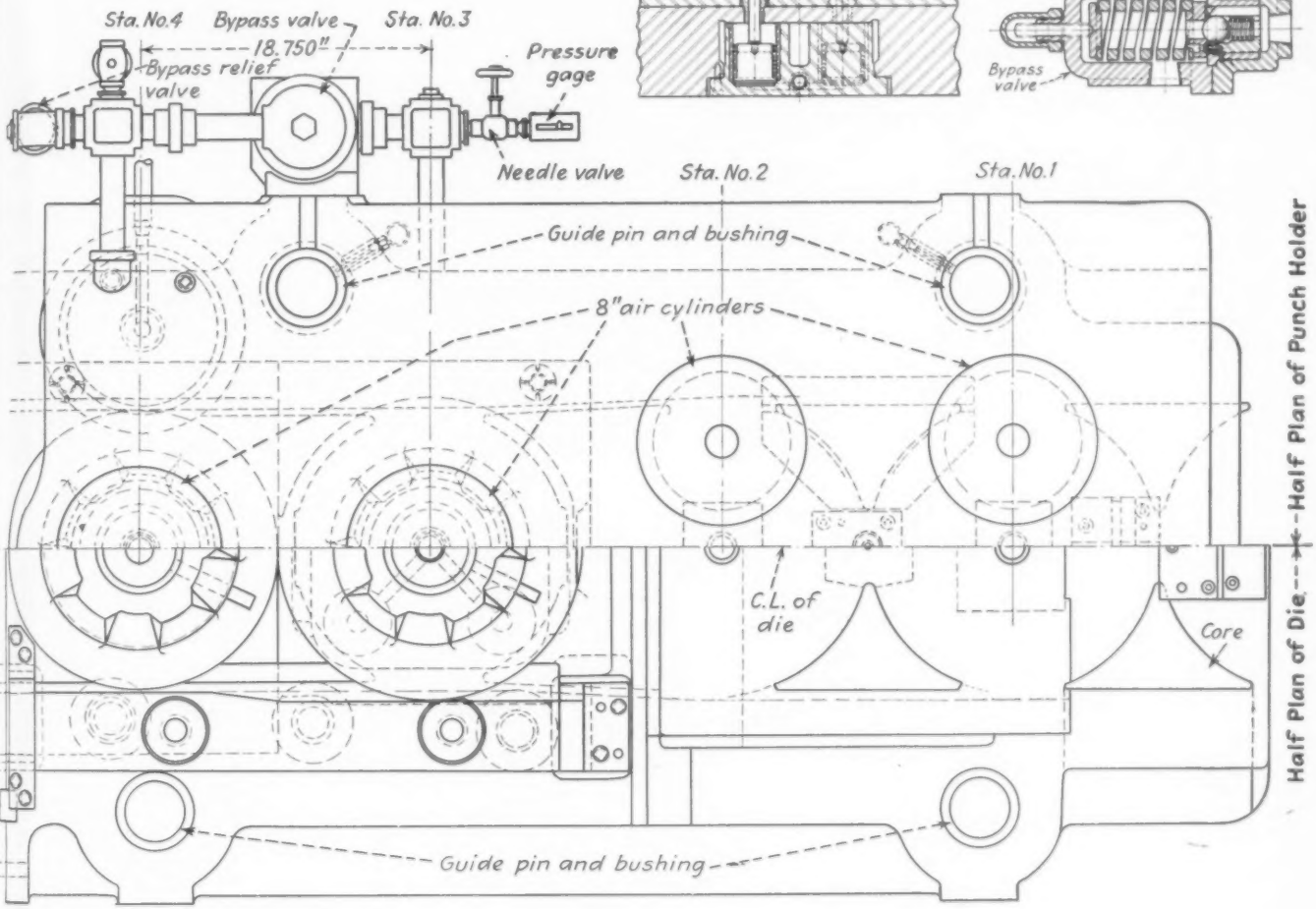
Very heavy construction is necessary for the eight-station progressive die developed for finishing rear brake drum webs for Chevrolet trucks from strip stock in one machine set-up. This die was made possible by incorporating a self-contained hydraulic system to operate the pressure pad at the third station. Four 4½-in. diameter hydraulic cylinders are connected to an air-loaded accumulator built into the die

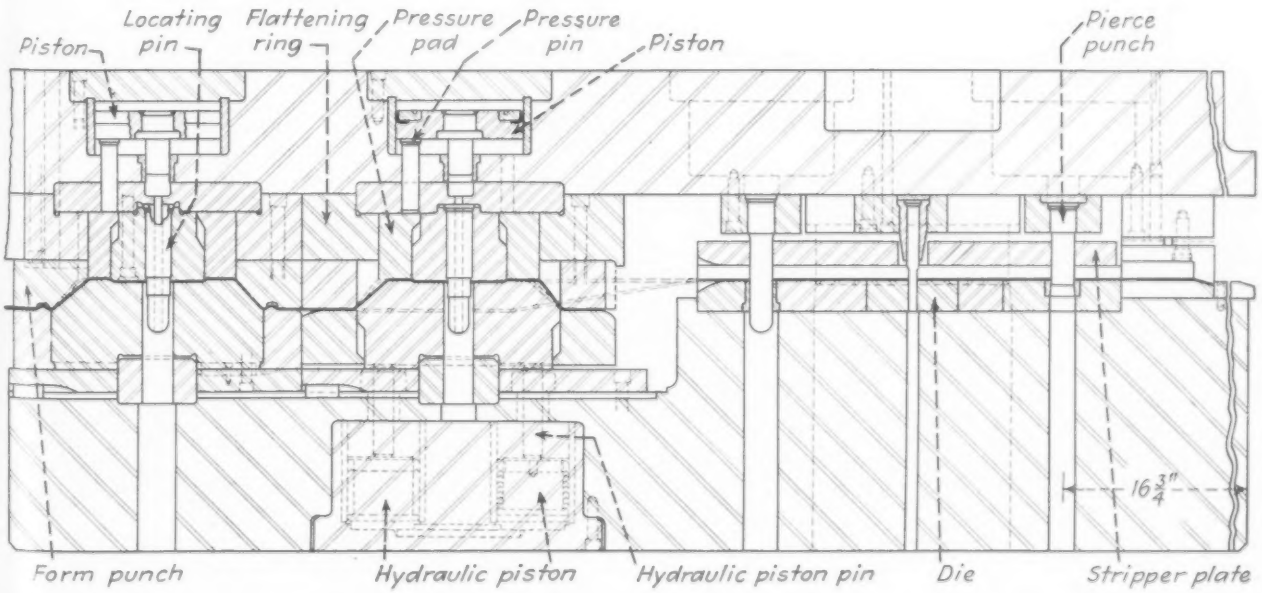




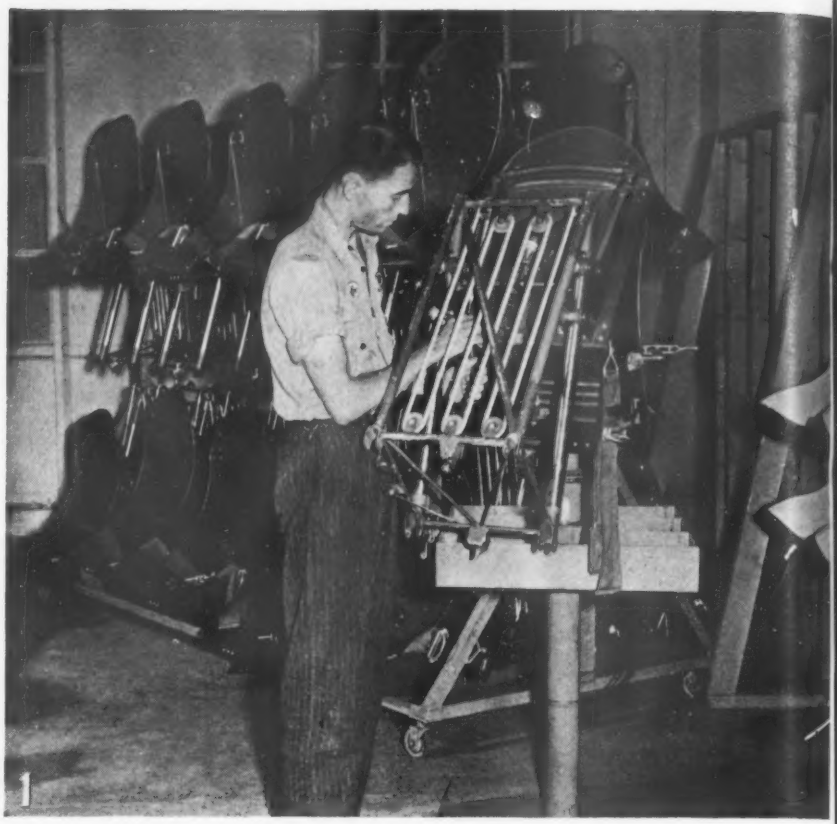
Details of the hydraulic equipment employed at station three are shown in these sketches. Air pressure for the "sump" cylinder is obtained from the shop supply line, and is applied all of the time the die is in operation







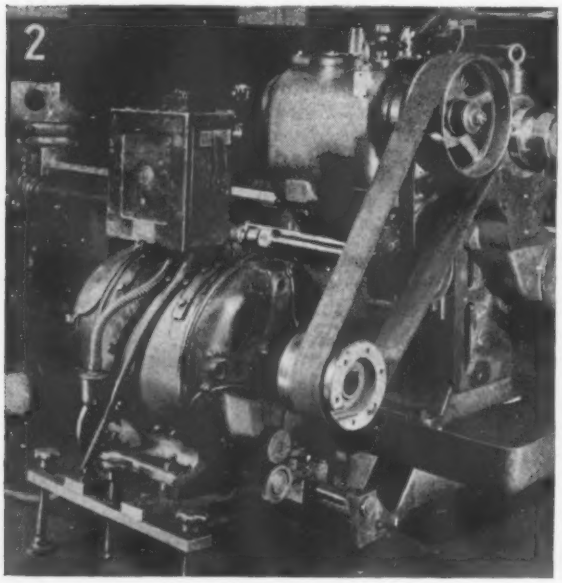
SHOP SHOTS

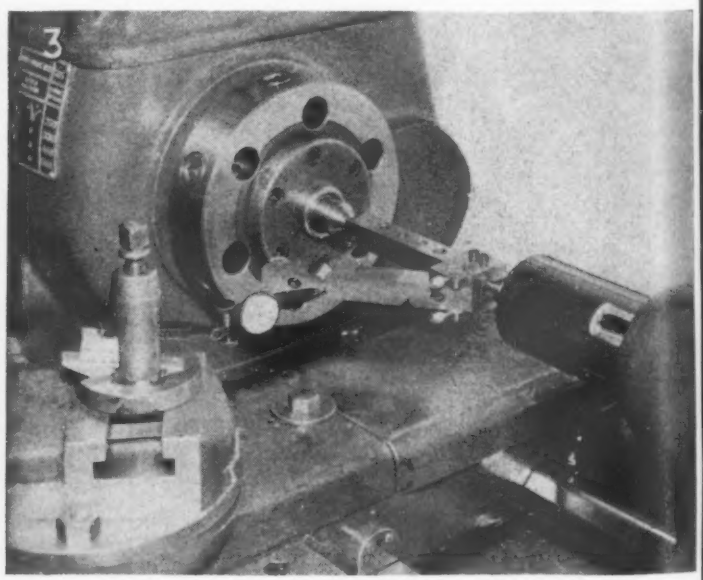


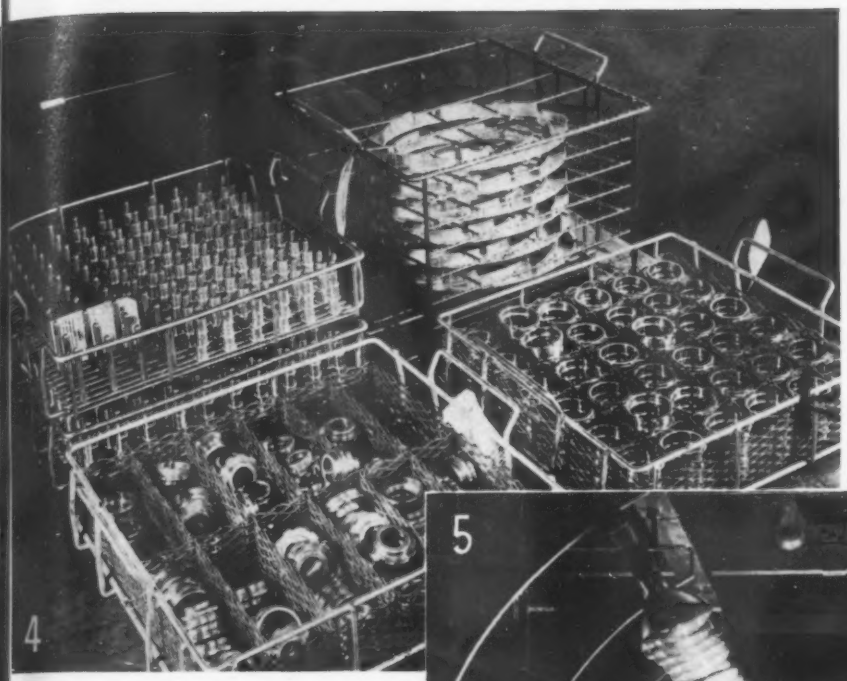
1. Subassemblies are completed and fully inspected wherever possible before they are delivered to the Vengeance dive-bomber assembly line. Observer's seat assemblies are put together and inspected in this specially constructed fixture. The entire unit may be rotated and tilted to bring any portion of the seat into position for easy fitting and checking. A small-parts tray is attached to the stand. Sheet steel barriers in this tray keep the parts separated to save time. In the background is seen a movable storage dolly on which completed seat assemblies are stored until needed. Nashville Division, Vultee Aircraft, Incorporated.

2. A portable 15-hp. motor is used for inspecting and testing turret lathes in the process of final assembly. The motor is connected by belt to a temporary pulley attached to the headstock drive. The bracket which supports the motor is hinged at one end and is adjustable vertically at the other so the correct belt tension can be applied. A controller is bolted to the motor frame, so that all wiring between it and the motor windings are permanent. It is only necessary to plug in one connection to a wall outlet. The Warner & Swasey Company.

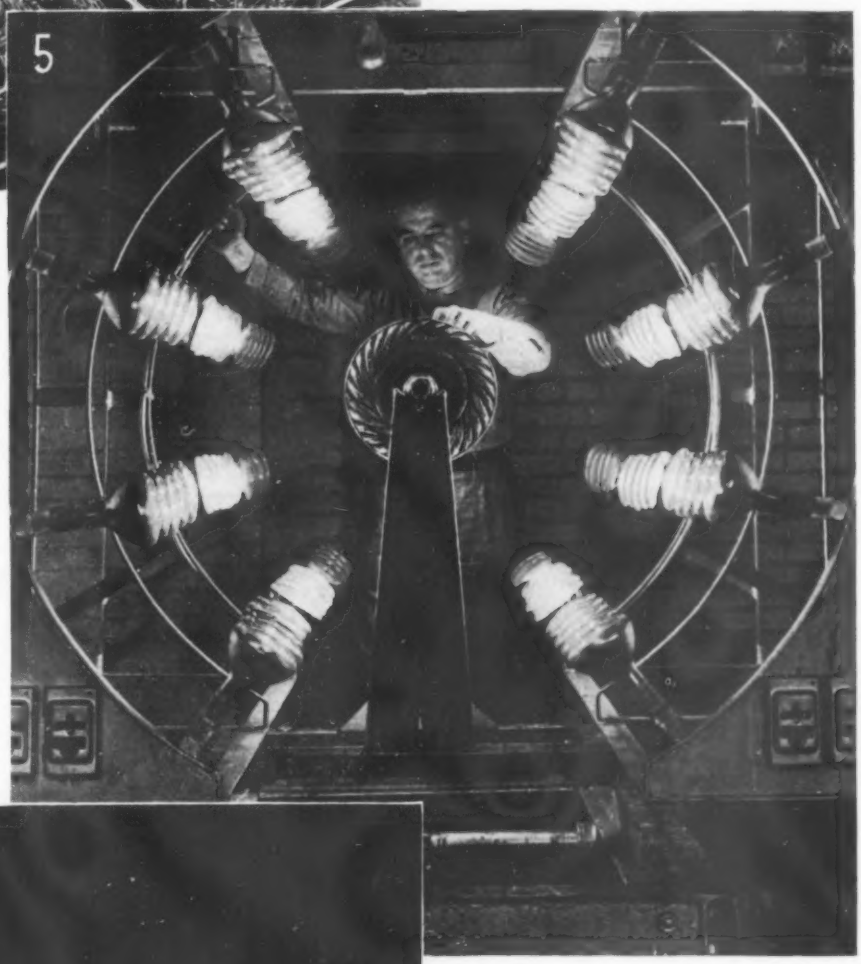
3. Angular setting of a lathe compound rest with sine-bar accuracy is possible with a tool developed by G. F. Greene, a general foreman at the Schenectady Works. One leg of the tool is mounted between the lathe centers and the other leg is opened to the desired angle. Precision setting of the angle is obtained by placing precision gage blocks of the required height between the fixed leg and a ground cylinder permanently fitted to the outer end of the movable leg. Two locking screws are provided to hold the movable leg in position after it has been set. Setting of the compound rest is checked by mounting an indicator in the tool post and traversing it along the outer edge of the movable leg. General Electric Company.







4. Resin-padded baskets have been developed by Packard for transporting Rolls-Royce aircraft engine parts through the finishing stages including degreasing. The baskets are sturdy enough to permit stacking when loaded, and the contents of any basket can be seen without disturbing the stack. Not only do these baskets prevent corrosion and part-to-part contact, but the Resistoflex PVA solution formulated for coating metal is so resilient that damage from careless handling is almost impossible. Baskets have been specially designed to handle parts of particular shapes. Resistoflex Corporation.



5. Armature baking time is cut to a third by infra-red radiant drying lamps in place of steam-heated ovens. The drying time for 12-in. armatures has been reduced from 18 to 5 hours. Reflector-type, 250-watt drying lamps are arranged in eight rows of 15 lamps each on adjustable racks. Heating temperatures range between 240 and 260 F. The lamp assembly is mounted in the old drying oven, and is positioned so that the armatures can be supported on the trucks used in the original installation. Each rack of lamps is supported from the roof on slides, which permit the lamps to be adjusted to the proper distance of 7 in. from the armature surface. Westinghouse Electric & Manufacturing Company.

6. Portable, knock-down stock tables with corners cut out to form working spaces partially surround operators who load and unload the circular beds of hydraulic presses. Designed by Group Leader K. L. Page, these tables have reduced fatigue for the crew members, and have increased production at least 25 percent. The usual practice is to surround each of the circular-bed presses with four tables, three for loading and one for unloading. Lockheed Aircraft Corporation.

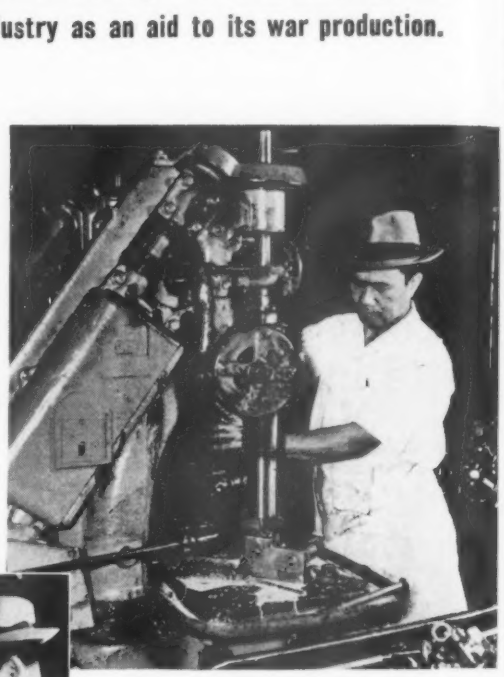
War Winning SUGGESTIONS

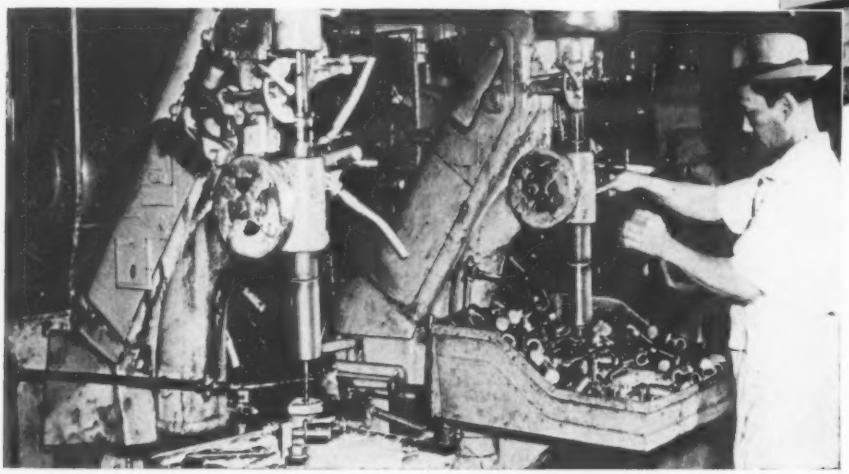
The following ideas were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive. They are freely offered to industry as an aid to its war production.

Automatic Feed Cuts Drilling Time

When drilling a spring shackle 3½ in. in diameter and 1½ in. thick, one part at a time was finished, the feed being operated by hand. It was loaded in a fixture, and when drilled the machine was stopped, the shackle removed from the fixture, and a new shackle loaded. By rearranging the sequence of drilling operations and adding power feed, one man now operates two machines simultaneously.

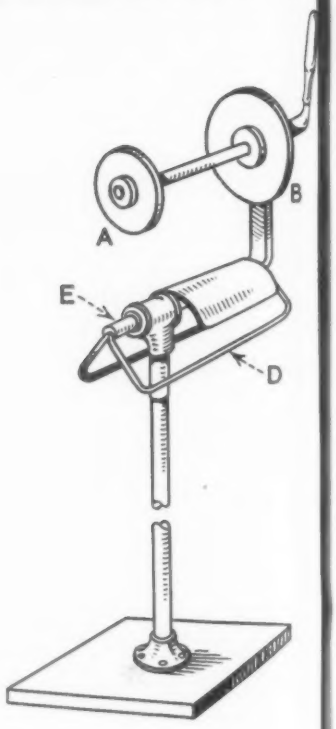
After a shackle is loaded in the fixture at one machine, the operator goes to the second machine, waits for the drilling to be completed and sets up a new part. Naturally it takes longer to drill two pieces than it does one; however, the actual time saved in drilling one piece is 33 percent. Each shackle is now drilled in 0.021 hours. *Suggested by William DeGroot, Yellow Truck & Coach Manufacturing Company.*





Adaptor Speeds Polishing of Cylinder Liners

When polishing the external wall of cylinder liners for a high-powered gasoline marine engine, the liner was formerly held by hand and spun against the buffing wheel. This hand operation has been eliminated by mounting the liner on plates *A* and *B* shown in the drawing, and moving the assembly against the buffer by handle *C*. The liner is moved laterally along the face of the wheel by pushing handle *D* back and forth, thus sliding spindle *E* in a bushed pipe tee on top of the stand. This tee is the trunnion about which the assembly swivels when advancing handle *C*. Use of the fixture saves approximately 1.2 hours work on each engine, beside improving the quality of finished surface. *Suggested by I. A. Clark, Marine Engine Division, Packard Motor Car Company.*

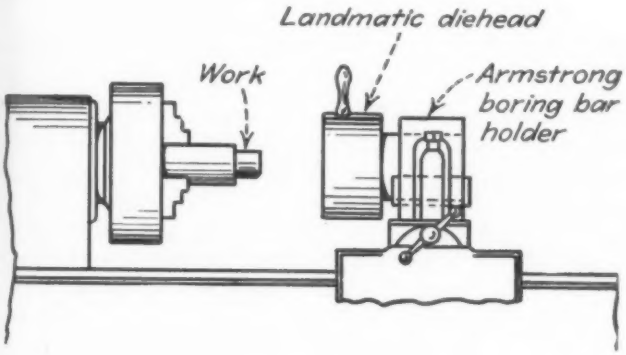


Diehead Applied to Engine Lathe

A Landmatic diehead mounted in an Armstrong boring bar holder, which in turn is held in the usual way on an engine-lathe toolpost, can be used instead of a single-point tool for running threads on bar stock. Short stock is held in the three-jaw chuck without other support, while long parts are supported on the outer end in a steadyrest.

On one of the units built at the suggestor's plant there is a drum shaft and a transmission shaft, both of which must be threaded on each end. It is estimated that 2,100 threads will have to be cut for units on order this year. Following are estimated savings based on actual time studies:

Material, Steel No.	Size and Pitch of Threads 2¼ in. Long	Time with Die, Min.	Time with Tool, Min.
S.A.E. 1040	2½ in.-12	4.0	8
N.E. 8744	1⅜ in.-12	3.4	10
N.E. 8744	2 in.-12	3.4	10
S.A.E. 3140	1⅛ in.-12	3.0	6
S.A.E. 1040	2½ in.-16	4.0	8



Average time with tool, min	8.4
Average time with die, min	3.6
Saving per thread with die, min	4.8
Saving on 2,100 threads, min	10,080.0
Saving on 2,100 threads, man-hours	168.0

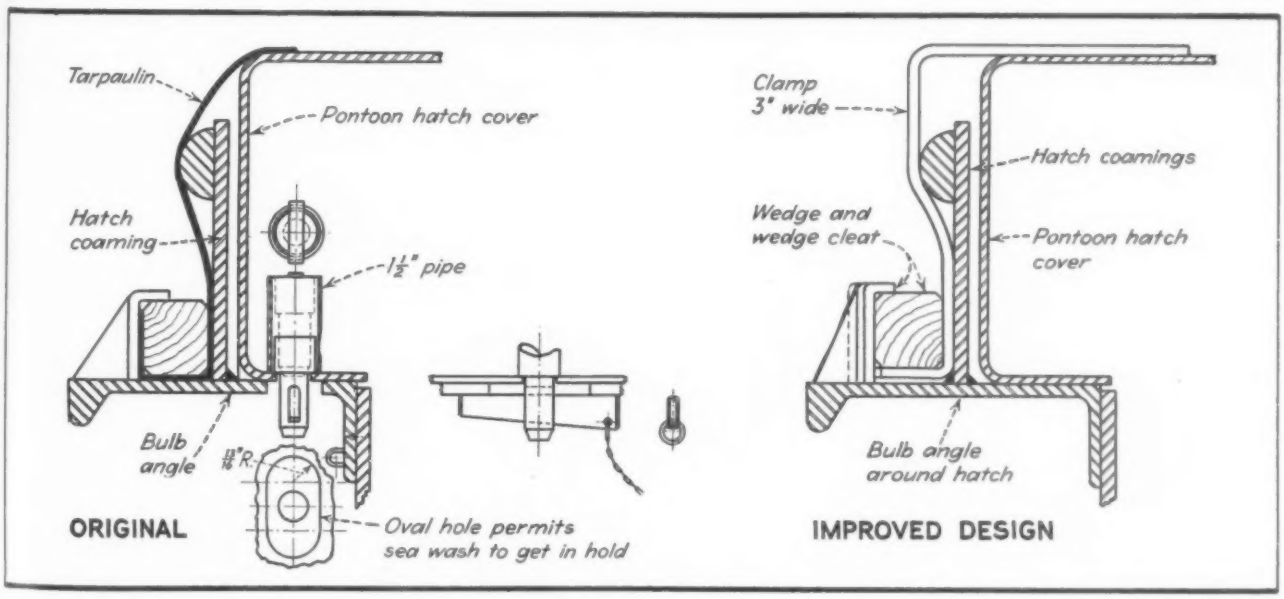
Suggested by William Sweeney, Williamette Hyster Company.

Pontoon Hatch-Lock Simplified

Locking devices are required to hold each section of pontoon hatch covers when one or more have been removed in loading and unloading cargo from the hold of a ship. When the ship is at sea these hatch covers are held in place or battened down by clamping bars. A common hatch-cover lock, as well as an improved design, are shown in the drawing.

The old lock, although a very elaborate arrangement, was entirely satisfactory except that it permitted the entrance of seawash through the oval openings in the bulb angle coaming around the hatch. The new design is much simpler, more accessible, and can be made at a considerable saving in time and cost. The old design was incorporated in several C-1 cargo vessels recently delivered by the suggestor's plant. The suggestion for the new design was submitted to the U. S. Maritime Commission inspectors, was immediately approved, and is being used on eleven C-1 cargo vessels now under construction. This new hatch-cover lock design, comprising a wrought-iron clamp, effectively prevents the passage of seawash past the bulb-angle hatch coamings, which is important on C-1 cargo vessels.

The improved locking clamp is held in place by wooden wedges that are also used to hold the tarpaulin covering when the hatches are closed; therefore, the wedges serve a dual purpose. *Suggested by Thomas P. Hogan, The Pusey and Jones Corporation.*



Templet Holder Eliminates C-Clamps

The precision filing of a templet requires that it be held firmly. The common practice is to hold it with a C-clamp to a steel plate or the edge of a tool bench, clamping and unclamping it every few inches. The more intricate the contour, the more changes in clamps.

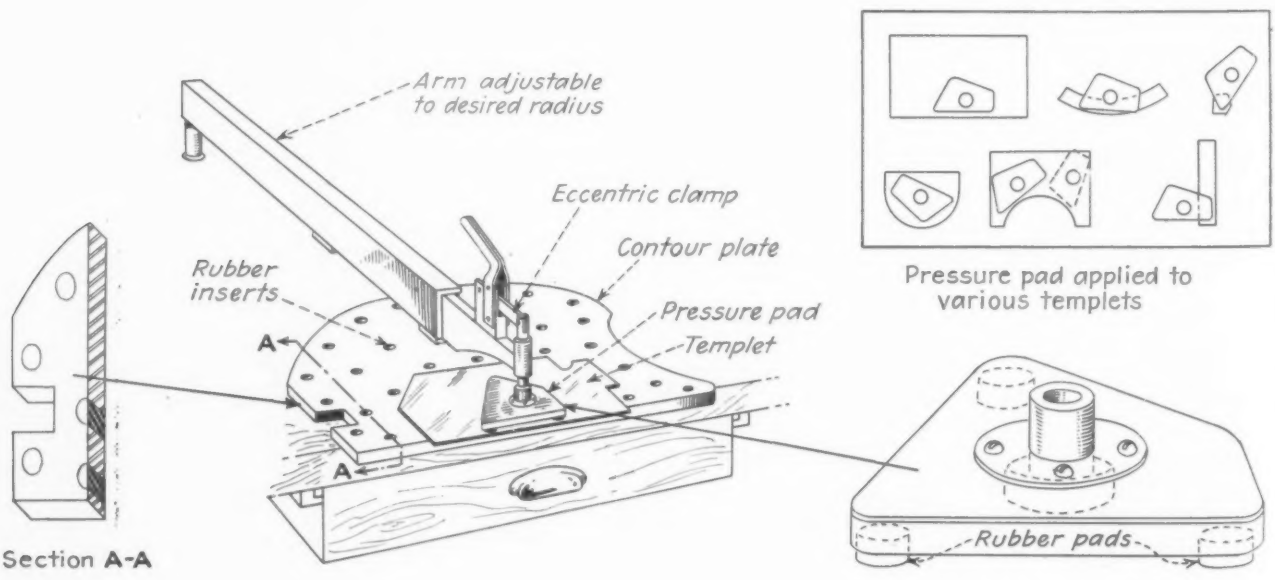
A single clamp that will replace C-clamps and steel plate or bench edge is shown in the drawing. A single motion will unclamp and clamp a templet to the contour plate under a pressure of 80 to 150 lb. The unit is a combination of a French curve and master contour plate, which can be adjusted to fit the contour of practically any templet. Rubber pads on the bottom of the vise plate and in the contour plate prevent the templet from slipping while being filed. The pads in the contour plate go through it and prevent it from slipping on the surface of the tool bench.

The following advantages are claimed for the device:

1. The templet is not scratched or marred by clamps, and does not have to be washed after filing.
2. The shape of the contour plate permits fewer changes in the position of the templet compared to the changes needed on the straight edge of a steel plate.
3. The templet is held firmly, making possible fast and accurate filing.
4. The templet can be released and clamped in a second or two.
5. Its use speeds the production of templets. For example, when making 1×9-in. rectangular templets, two men unfamiliar with the device made their set-ups using the device and the C-clamp method with immediate savings in time of 150 and 162 percent, respectively. Another, an experienced operator, made his set-ups with a C-clamp in 81.6 sec.; using the new templet clamp he made the same set-ups in 13.6 sec.—a time saving of 623 percent. *Suggested by S. Reynolds Divine, Edo Aircraft Corporation.*

Grinds Fit on Torpedo-Tube Flange

The former method of grinding and blending the steel barrels of torpedo tubes with the flanged face of the brass caps was to hand grind, file and scrape, requiring the services of skilled fit-up men. By means of an air-operated portable grinder mounted on a pivoted and counterweighted arm, this operation is now being accomplished with little effort. This set-up, shown in the illustration, produces a smooth surface that requires no hand fitting of the steel tube and its brass cap. The work is now done by unskilled help at a saving of 2,500 man-hours a year. *Suggested by Ralph Miller, Nordberg Manufacturing Company.*



Textiles—in War as in Peace

World's oldest industry performs modern miracles

WITH ever quickening tempo the friendly hum of the spinning wheel has echoed down the centuries—symbol of a mighty industry.

Its hum is heard today above the din of war.

Capt. Rickenbacker heard it as the lives of his party depended upon a thickness of rubberized fabric.

The hard-pressed soldier on a far-off Pacific isle hears it when he sees fresh supplies and ammunition descending from the sky via friendly parachute.

Adolf Schickelgruber hears it when winter joins forces with the enemies of his ill-clad armies and hastens the day of his defeat.

Yes, man is dependent upon textiles from the cradle to the grave – in peace and in war.

In peace man demands comfort and beauty. In war he must have comfort and protection. The textile industry is coming up to these expectations.

It is developing hundreds of special fabrics for special purposes. It has created clothing for wear, miles high in the stratosphere, and fathoms deep under the sea, clothing to meet the daytime heat of the desert and the bitter cold of its nights, clothing for the tropics and the Arctic, the swamps and mountains – for every climate and every condition.

Modern scientific warfare has forced the development of textiles that were not even thought of a year or two ago: camouflage nets; strong, light, wind-resistant Nylon tentings for the Arctic; heavy Nylon rope for glider towing; parachutes and parachute shrouds; self-sealing gas tanks; panzer hangars; cartridge and powder bag cloths; helmet linings; gas masks; fuses; canvas tops; windshield fabrics and seat upholstery for jeeps, trucks and other motorized equipment; uniforms for all armed services and for nurses, WAACS, WAVES, SPARS and MCWRS. Then there are windbreakers, raincoats, ski-troop uniforms and other items two numerous to mention. The Star Spangled Banner itself is a textile.

The Quartermaster Corps alone has issued specifications for over 300 different fabrics! Add to this the requirements of the Navy, the Air Forces, the various Civilian Defenses, the Red Cross and Lend-Lease and the sum total of textiles required for military and allied uses is approximately 70% of the total produced before the war to meet civilian requirements!

How the textile industry has been able to meet this unprecedented war demand, superimposed upon the industrial and essential civilian needs, is an inspiring story.

First, it stepped up its production to an all-time high. *Textile World's* index of textile-mill activity records three successive records for 1940, 1941 and 1942, the period covering the defense program and the first year of the war. This index for 1942 stood at twice that of an assumed "normal" year. It is noteworthy that this was accomplished mainly with existing equipment.

Second, the textile industry did a job of plant-conversion which was a masterpiece of intra-industry cooperation and idea-sharing.

Third, its technicians developed new and superior fabrics and finishes. Its engineers and production men increased the speed and the efficiency of the entire production machine.

How well all this was done becomes evident when we consider the obstacles to be overcome. Imports of critical fibres have been cut off. There is a shortage of certain chemicals and dyes. There is a high rate of turn-over in manpower and a shortage in experienced labor. It is increasingly difficult to secure machines and repair-parts – just to mention a few of the major problems.

But the textile industry delivered. It has built up an adequate reserve for our rapidly expanding armed services. It is helping to supply the armies of our allies. It is providing for our civilian population . . . all without giving the war leaders a single moment of serious worry.

Major General Edmund B. Gregory, Quartermaster

This is the ninth of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers, and in daily newspapers in New York, Chicago and Washington, D. C. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

General of the United States, in special statements prepared for *Textile World*, and in addresses before textile groups, has stated that the cooperation of the textile industry has been outstanding and that the industry has kept ahead of schedule on all the major types of fabrics required.

General Gregory recently pointed out that of the approximately 234,000,000 yards of combed twill produced in this country in 1942, the Army took about 87%, the Navy 10%, leaving 3% for non-military purposes.

Col. Robert T. Stevens, of the Quartermaster Corps, in a recent address, referred to the output of duck. Production of that vital military fabric was twice doubled in six months, between January and July 1942, he said, and an annual capacity of 600,000,000 yards of all types of duck was made available. "The current rate of production of cotton duck is five times normal," said Col. Stevens, "and 38% comes from converted carpet, plush and upholstery mills. Based upon known requirements, production in this field is fully adequate".

"Fully adequate" is high praise when it refers to duck production. At the outbreak of the war it looked as if there was no possible chance of meeting requirements, at least during the first year. Nor would there have been if other types of mills had not shifted to making this fabric, and if experienced duck manufacturers had not gone "all-out" in teaching the newcomers, potential post-war competitors, everything they knew about the manufacture of duck. American industry offers many such examples of unselfish cooperation.

Another outstanding accomplishment, made necessary by the interruption of burlap imports, was the conversion of looms producing peacetime fabrics to the production of bag fabrics. The tremendous demand for sandbags, camouflage cloth, food, agricultural and other bagging, caused a conversion order to be issued for the purpose of raising the annual production rate of osnaburg from 263,500,000 yards to 660,000,000 yards, and bag sheeting from a rate of 488,000,000 yards to 855,000,000 yards. The result of this order, and of the military schedules already in effect, was to put the cotton weaving industry about 88% into war, essential industrial, and essential civilian production.

Plant conversion went on with feverish speed. Carpet looms were swung to blankets and duck; the lace industry turned to mosquito netting and insect netting of which it produced millions of yards. The flat-knitting industry with its tricot machines also is engaged in the manufacture of mosquito netting. The sewing thread industry was converted to the production of combed yarns. What once was the silk industry is now doing a tremendous amount of war work. Those mills which had equipped themselves for throwing Nylon yarns for hosiery are now throwing the Nylon for parachutes. That section of the silk industry that was equipped for weaving rayon fabrics is producing fabrics of high-tenacity rayon for flare chutes, cargo chutes and delivery chutes. Many silk and rayon looms that formerly wove clothing materials are now weaving parachute fabrics.

Today practically all Nylon is used for military purposes and the bulk of high-tenacity rayon goes into military fabrics.

Above and beyond all the new developments is the gigantic job of producing millions of yards of standard fabrics of many colors and weaves. To produce all the uniform fabrics and blankets is in itself quite a job. The woolen and worsted industry has been doing it magnificently. Tent fabrics and summer fabrics produced by the cotton industry are no less a formidable assignment. I could point to myriad other jobs no less impressive.

The production man can indeed take pride in this record and behind the production man, the textile technician has been working tirelessly. Mildewproofing and waterproofing, so vital in a world at war, are in a new stage of effectiveness. A new process for waterproofing fabrics employs vinyl acetal plastic in place of precious rubber. Textiles that glow in the dark have been perfected for black-outs and other applications. American genius is solving problems many of which seemed insurmountable. Silk, for example, was something the Japanese thought we could never duplicate. A new synthetic textile filament that weighs but one eighth of the finest silk filament threatens to put the Japanese silkworm out of business after the war so far as we are concerned. The post-war possibilities of this development challenge the imagination.

Nor has the primary textile industry been alone in its contribution to the war. The textile machinery industry has been converted almost entirely to war work, save for a few facilities required to relieve extreme bottlenecks and supply essential maintenance and repair-parts.

Similarly, some textile mills, particularly hosiery mills hard hit by the silk and Nylon cut-off, are utilizing their space and skilled staffs to produce parts for war equipment.

The immediate significance of all this is its importance in the winning of the war. There is, however, a post-war implication which is important to the future of America. A mass production textile industry will serve civilians after the war more effectively than ever before, and will put new standards within the reach of millions. A long step has been taken toward that completely synthetic textile industry which some observers see in the future. The tempo of such changes has been accelerated tremendously. The oldest industry in the world, now one of America's largest, is showing a youth and vigor that promise much for the future . . . nationally and internationally.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

SURPLUS MACHINE TOOLS—A Plan

BY J. R. PORTER, CHAIRMAN, MARSHALL & HUSCHART MACHINERY COMPANY

What to do after the war with surplus machine tools owned by the Government? That is a question bothering machine tool builders as they think ahead to their post-war markets. Mr. Porter herewith offers a specific plan which should stir discussion. If you should agree or disagree with his plan, or if you should have a pet scheme of your own, the editors of AMERICAN MACHINIST invite you to write them your views.

MACHINE TOOLS are just as indispensable in peacetime as in time of war. They form the basic industry upon which all other production depends, including the manufacture of machine tools themselves. They are the only type of mechanical mechanism that reproduces itself.

Mass production of any commodity is impossible without the use of machine tools. You can destroy completely any given industry, such as automobiles or agricultural implements or textiles, and within a relatively brief period rebuild it by the creation of new machine tools. But if you should destroy the machine tool industry itself, you would retard our industrial economy for many, many years until a new machine tool industry could painfully be established by making tools at first by hand.

It obviously is to the nation's interest to preserve this key industry. The time to begin to fight for that preservation is now, when the industry is turning out far more machine tools than at any previous time in its history.

At the beginning of the defense program, the government asked the machine tool industry to increase its output to unprecedented heights. The result was that in the four years of 1939, 1940, 1941 and 1942, machine tool builders produced more machine tools than in the preceding forty years. Many companies today are producing more in a single month than they would in an entire average peacetime year.

It is plain that at the war's end a tremendous surplus of machine tools will be available for industrial use. Should the government follow the precedent set in the First World War, these machine tools, which to a great extent are owned by federal agencies, would be sold to industrial users and speculators at prices ranging from ten to twenty-five cents on the dollar. The benefits from such procedure would be derived solely by those who would purchase the machine tools at ridiculously low prices. The market for new machine tools thus would be wiped out for such a length of time that few machine tool builders could survive.

Furthermore, the present necessary curtailment in production of peacetime consumers' products, creating as it will a large potential postwar market, cannot aid machine tool builders substantially. The reason for this is that a huge surplus of machine tools may be transferred from present wartime plants to future peacetime factories. Thus the machine tool industry in providing the sinews of war has destroyed its postwar opportunity.

In order that the machine tool industry can continue in business and can contribute its part to producing more and better products at less costs, I suggest the following plan to be followed by the government:

1. All machine tools in which the government or any of its agencies has an interest and which are to be disposed of after the war should be sold to the original manufacturers.

2. Resale of these machines for industrial use should be made by the original manufacturers through their regular sales channels.

3. None of the surplus equipment is to be sold by the government to speculators.

4. Government agencies should carry out agreements made with war contractors whereby the latter have been given an option to purchase the equipment left over from war operations. However, the sales transactions in such cases should be conducted for the government by the machine tool builders whose products are involved. Prices should be fair and reasonable and should be determined on the basis of value rather than of liquidation expediency.

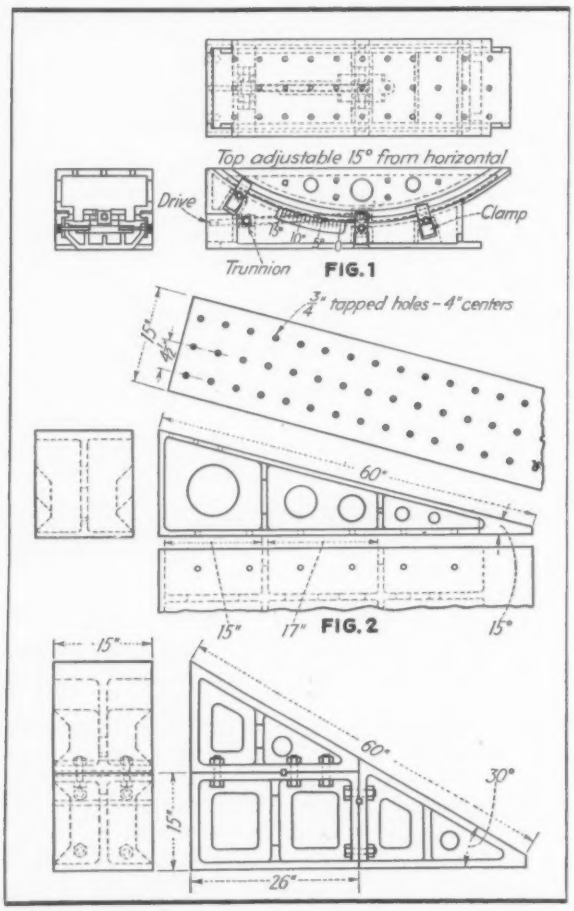
5. Machine tool builders obviously would not be in a position to finance the purchase of all surplus machines of their own make and carry the inventory involved. Hence, the government should not be reimbursed for each machine until time of its resale, following the procedure now applying to disposal of government pool - orders machines which have been finished and in warehouses.

6. Prices for resale of these machines by machine tool builders should be established on the basis of "As Is" or "To be reconditioned by the manufacturer and carry the original guarantee as to accuracy, etc." Prices should allow a reasonable margin of profit after expenses, such as sales and service expenses and handling.

Resale of all government-owned equipment that federal agencies will wish to dispose of will be highly competitive and will require intensive sales efforts. The profit that will accrue to machine tool builders will make it possible for them to continue to develop, design and engineer improvements of their present lines of machines and to develop completely new machine tools.

It is possible that the suggested procedure for disposal of surplus machine tools will bring the government a greater return than could be achieved on a liquidating basis, and at the same time would eliminate the chance that speculators would make a large profit out of the war after the war has ended.

IDEAS FROM PRACTICAL MEN



Blocks of this design can be used on the planer or boring mill. They can be used singly, or in combination to machine any desired angle on the work

Angle Blocks Save Set-Up Time

BY E. L. MARKS

Whenever work has to be planed parallel, some kind of blocking becomes necessary. If such jobs come regularly, even if not very frequently, it will pay to provide blocks of the proper angles since they save valuable time in setting up work. The size and angles of these blocks depend on the work to be done.

To handle work of this kind the American Engineering Works, Philadelphia, Pa., have made substantial blocks that handle any angle up to 45 deg. and work of considerable size. There are three blocks, one of 15 and one of 30 deg., and an adjustable block with a movement of 15 deg. from horizontal. When either 15 or 30 deg. or 45 are required, the block can be used singly or in combination. But for work less than 15 deg. or for angles between 15 and 30, between 30 and 45, or between 45 and 60, the adjustable block comes into play.

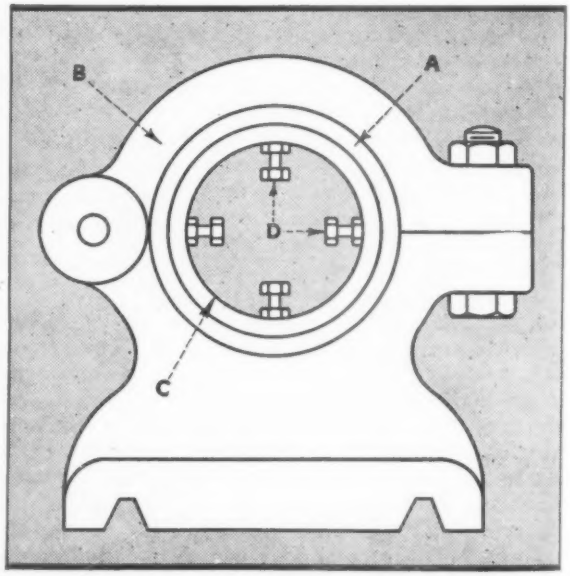
Details of construction of these blocks are given in Figs. 1, 2 and 3. The angular plates are 60 inches long on their faces and have ¾-in. holes tapped in these faces at 4-in. centers. As will be seen these are blocks for handling fairly large work. For smaller work the design and construction can be modified to suit conditions.

By using the adjustable block any angle up to 15 deg. is easily secured. Used with the 15-deg. block, it gives any angle up to 30 deg. With the 30-deg. block, angles to 45 deg. can be obtained, and with both blocks, any angle up to 60 deg. is available. The graduations are so widely spaced that half and quarter degrees can be easily read.

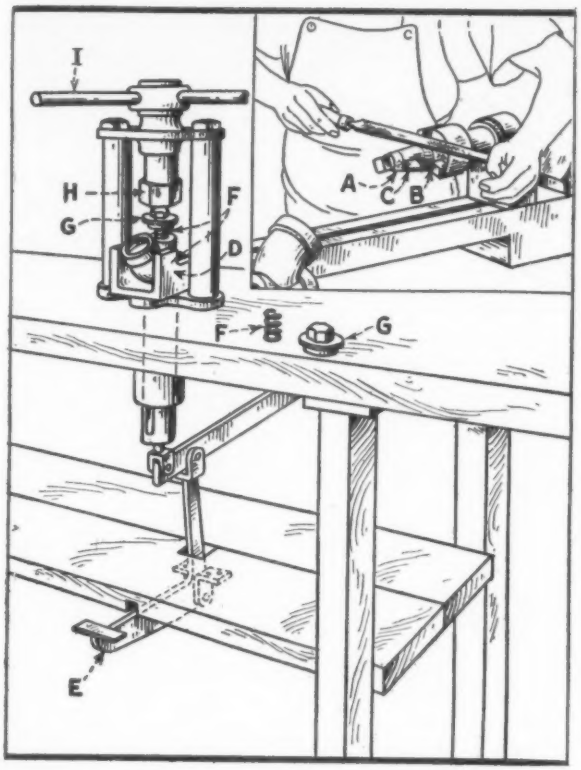
A Steadyrest that Holds Irregular Shapes

BY FRED H. COLVIN

The illustrated steadyrest can be used to support square, hexagonal, or irregular shapes in a lathe for turning and boring. Inside the steadyrest proper is a loose ring *A* that turns in the two halves *B* and *C* of the rest. Bolts *D* projecting inwardly, can be adjusted to fit that part being machined. Ring *A* is machined with shoulders that run in grooves turned in the body of the steadyrest *A* and the inner ring *C*. With the inner ring *C* clamped to the work by the bolts, which can be varied in both length and number, odd-shaped work can be well supported during machining operations. Such a steadyrest has many uses in any job shop.



This steadyrest, comprised of a floating center ring and an inner ring with adjustable holding bolts, can be used to turn and bore parts of irregular shape



Trainline anglecock bodies can be assembled quickly with this tool which compresses the heavy retaining spring easily. Unworn sections of the valve seat are filed flush with the worn portion to speed grinding and insure good seats

Assembly of Trainline Anglecocks

BY OSCAR HEUER

The dismantling, grinding and assembly of trainline anglecocks is a routine repair in major railroad car shops. One eastern railroad found while making such repairs that little grinding would be necessary to reseat the valve if the unworn parts *A* and *B* of the seat were filed down to the size of the worn portion *C*. The valve seat is held in a universal chuck on a bench lathe for this operation. After filing, six valves are mounted in a grinder which has facilities for raising and lowering the anglecock body on the valve as the seat is being ground in.

After the valve has been ground, the spring and retaining cap for the valve is assembled in the illustrated bench tool. It consists of saddle *D* made from angle iron and in which the anglecock body is placed and raised or lowered by foot pedal *E*. Spring *F* and retainer cap *G*, after being placed in the anglecock body as shown in the drawing, are closed by raising saddle *D*, thus compressing spring *F* which, under normal conditions is difficult. Retaining cap *G* fits into the socket of wrench *H*. A few turns of wrench handle *I* threads retaining cap *G* in the anglecock body, thus completing the assembly. This operation requires but a few seconds.

Prior to using this tool, one man was required to assemble the anglecocks. The work is now done by the same man who grinds the valves.

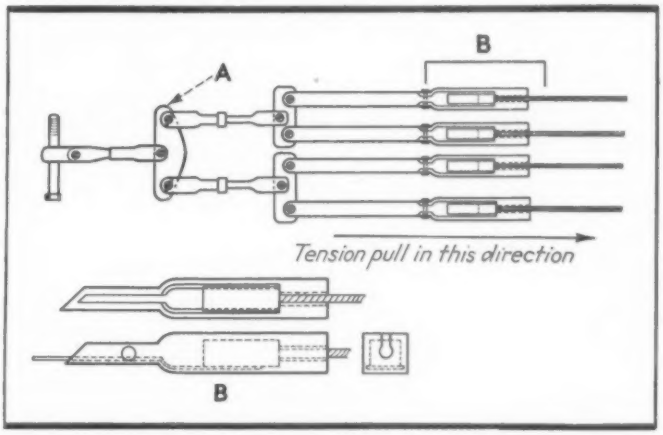
Multiple Testing of Plane Cables

BY JOSEPH WILDNER

Nashville Division, Vultee Aircraft Corporation

Army specifications require that each control cable for the Vengence dive bomber be proof-loaded by holding it in tension for three minutes. By the original method, cables were loaded one at a time, each set-up requiring one minute for two operators. At four minutes over-all time for each of the 120 cables used in the plane, proof-loading required two operators for an entire eight-hour shift.

By using the illustrated toggle arrangement *A* and fast-action clamps *B*, substituted for turnbuckles and eye-attachments used in the original setup, four cables may now be proof-loaded at one time. Two of the units shown in the drawing are required, one for each end of the group of four cables. The units are constructed to equalize tension on each cable. Four cables can be set-up in two minutes, or 120 cables in 60 minutes. Each set-up is proof-loaded for three minutes, making a total loading time of 1½ hours for the 120 cables. In other words, what previously required 16 man-hours of work can now be accomplished in 2½ hours. The development of these tools has relieved a bottleneck in the plant which was fast becoming serious as production increased.



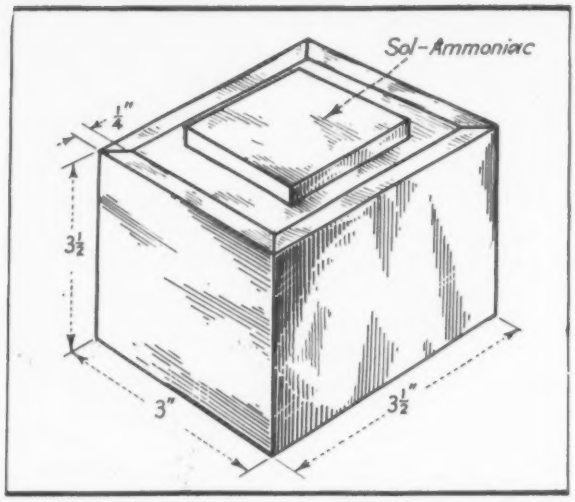
The time required to proof-load the 120 cables required in the control system on one type aircraft has been reduced from 16 to 2½ man-hours with the aid of this testing device

Holder Prevents Waste of Soldering Flux

BY C. F. FITZ

In one of our departments where a large amount of soldering was being done, we were wasting a considerable portion of the sal-ammoniac blocks. It was found upon investigation that workmen in using these blocks would either burn a hole in the center causing it to split apart, or the blocks would be pushed off the benches and broken on the floor.

This trouble was eliminated by making the sal-ammoniac block holder shown in the drawing. It is



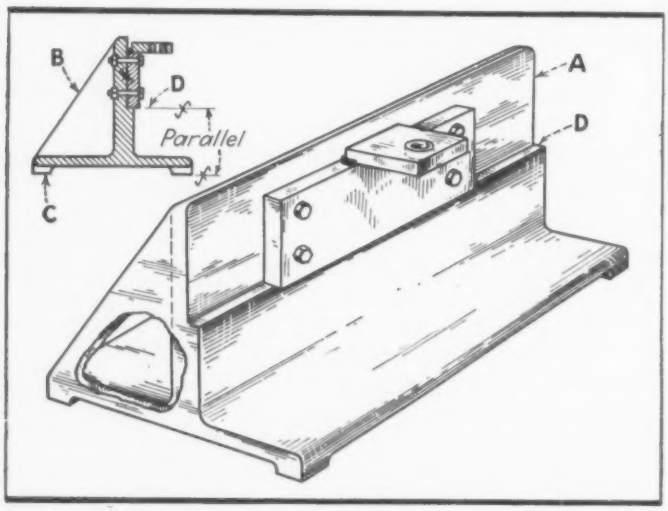
To prevent workmen from wasting sal-ammoniac blocks, they can be inserted in wooden blocks. The sal-ammoniac can be kept exposed by burning the wood with a hot iron

simply an oak block with the center cut out to receive the flux. When in use, the workman rubs the soldering copper over the face of the sal-ammoniac. After it is worn down flush with the block, the hot soldering copper is rubbed over the wood, burning it down below the surface of the sal-ammoniac block.

A Universal Drill-Jig Stand

BY EUGENE GROSZ

In small-part manufacturing much time can be saved by using the illustrated universal drill jig stand. Base *A* is a casting with two ribs *B* and four finished pads *C* serving as feet. The face of the casting is finished with ledge *D* milled parallel to the base line for lining up the jig which is to be fastened to the stand. There are four drilled and reamed holes for bolting the jig in place. The jigs can be made without legs, because they can be strapped to the stand when in use. The saving is in the time it takes to make the jigs that can be used in conjunction with the design.

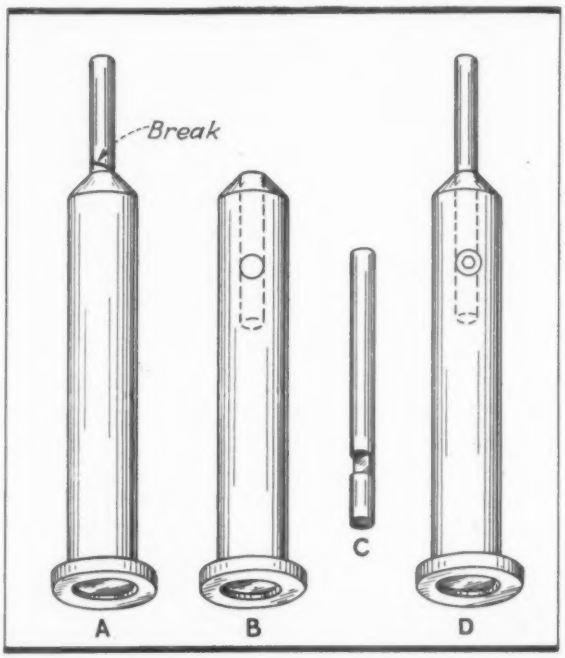


Drill jigs can be made without legs and fastened to this stand, thereby saving material and time required to make complete jigs

Salvaging Broken Punches

BY R. H. BEARD

Much tool steel can be saved by salvaging worn and broken punches of the type shown at *A* in the accompanying sketch. The end of the punch is ground off as shown at *B*, and the shank is drilled for inserting separate punch rods *C*. A hole is drilled and tapped in the side of the shank for a setscrew to lock the punch rod in place as shown at *D*. The drill rod punch may be used as long as the original punch and, when worn, may be replaced at minimum cost. Previously, each worn shank had to be replaced with a complete new punch.



When small punches have been worn or broken they can be salvaged by grinding off the original punch tip and drilling for drill-rod punch inserts

Handle Speeds Use of Thread Gages

BY ELLIOTT HUTTON

The application of a revolving knob to our thread inspection "go" gages has reduced by 50 percent the time required to check the threads. The handle, made of $\frac{1}{2}$-in. round plastic, makes for better balance in starting the gage. The balance or ease of operation may be regulated by moving the knob toward or away from the center of the gage shank. For a 2-in. thread gage we use a $1\frac{1}{2}$-in. diameter knob with a brass insert for a bearing surface. A $\frac{3}{16}$-in. socket head setscrew tightens the knob assembly on the $\frac{1}{2}$-in. handle.

Armament

SECTION OF AMERICAN MACHINIST

Gadsden Feeds the 105's

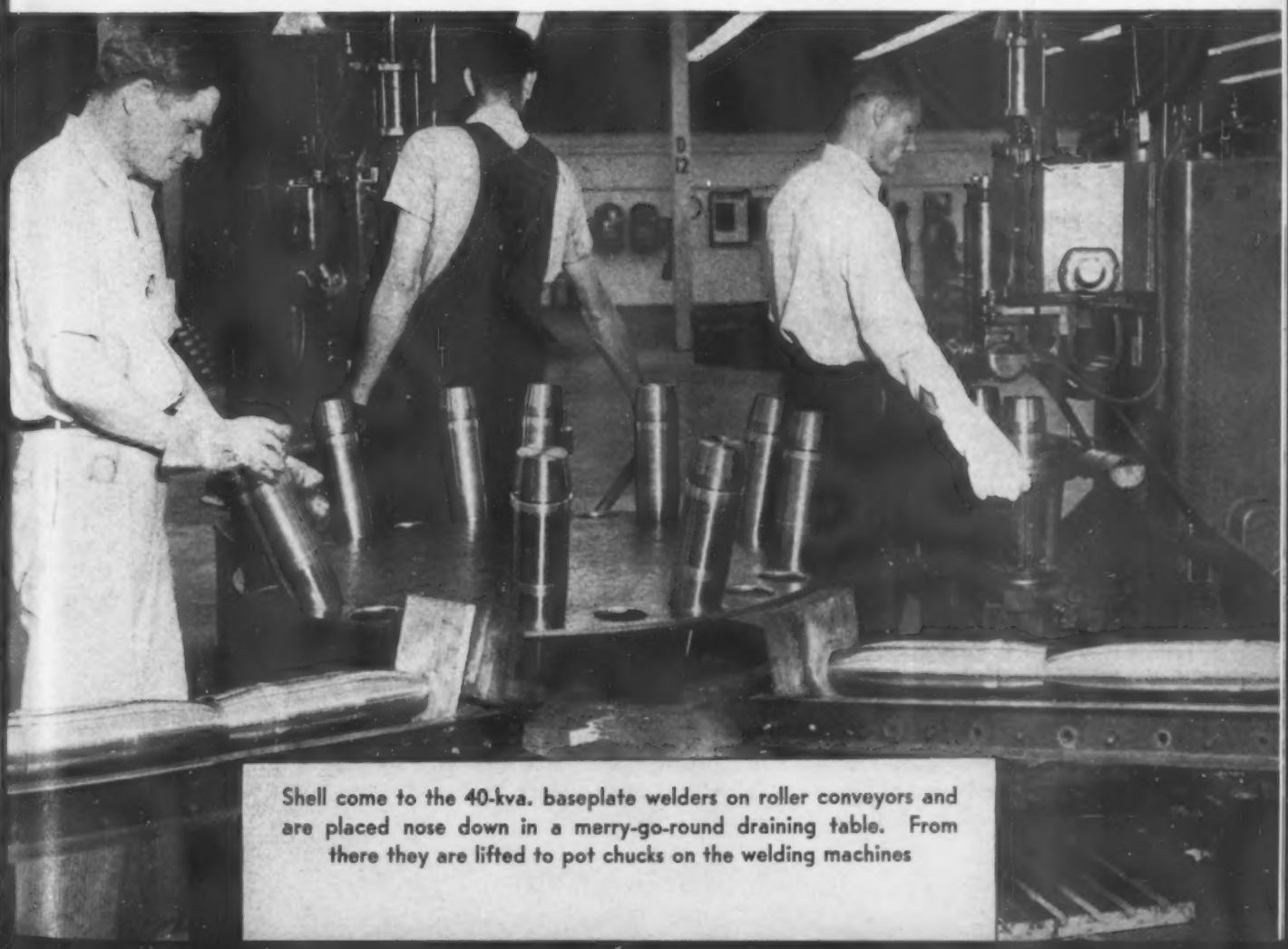
By WALTER N. HOWLEY

President, Lansdowne Steel & Iron Company

A YEAR after it produced its first shell forgings, the Gadsden, Ala., ordnance plant of the United States Army was flying the coveted Army and Navy Production Award burgee. Upon completion of the initial shell contract, the cost of the plant to the government will have been written off by means of the manufacturing savings made.

Such success would not have been possible without the counsel and active cooperation of Major-General Levin H. Campbell, Jr., Chief of Ordnance and Ordnance Department officers. Nor would it have been possible without the devotion of the plant supervisors and of each individual employee to his job.

More than 99 percent of the workers are local people who have been trained in a surprisingly short time to operate machine tools and other shop equipment. Practically the only men with previous training are the toolroom workers, most of whom are



Shell come to the 40-kva. baseplate welders on roller conveyors and are placed nose down in a merry-go-round draining table. From there they are lifted to pot chucks on the welding machines

trade school graduates, but have gained skill quite rapidly.

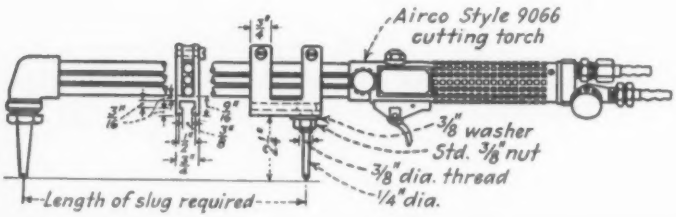
A major advantage of the Gadsden plant is the fact that it is set up to make only one size and type of shell—105 mm. high explosive shell.

There are separate buildings for forging, machining and heat-treating operations. The entire plant is laid out as nearly as possible for straightline flow of work. Flexibility was not possible in the forging and heat-treating departments, however, because large pits are needed under the different units.

The normally high temperature at Gadsden added to the heat from machines and motors, made air conditioning of the machine shop a virtual necessity. Temperature inside this 150,000 sq. ft. shop is kept during summer at 78 to 80 deg. F., with 47 percent relative humidity. In winter temperature is held at 70 to 72 deg. Some 48,000 fluorescent light units provide shadowless illumination in the machine shop.

The methods chosen for moving materials around the plant were on the basis of the cost per piece. Forgings are taken from one department to another on tractor-drawn trailers or on heavy wooden platforms lifted and carried by electric trucks. In the machine shop, hand trucks move shell about until the bourrelets have been ground. From that point on, shell is carried along on gravity roller conveyors. Conveyor sections have steel spool-type rollers between all operations preceding finish turning of the gilding metal rotating bands. After band turning, spools are of wood so as not to damage the bands. Each conveyor section is mounted on temporary wooden supports and can be shifted around when necessary.

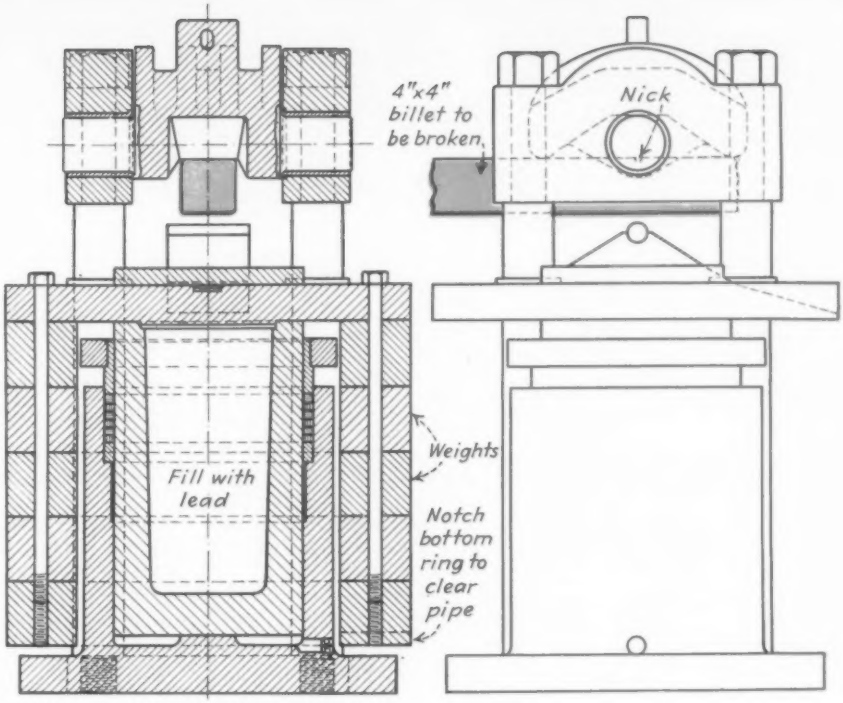
All marketable scrap is salvaged and segregated for sale. Even the scale from the descaling machines in the forge shop is collected and sold. Every effort is made to save metal and tools by reducing to a min-



A gage on each cutting torch used for burning nicks in billet bars eliminates the need for marking slug lengths according to a scale measurement. The gate pin is set against the end of the bar, or in a burned nick, to locate the cutting tip for the next nick

Three men normally operate each slug breaking press. The steel billets usually break clean at right angles and are inspected for seams, pipes and other defects before charging into a heating furnace

Cast steel weights and a lead core serve to return the slug breaker ram quickly when the control valve is reversed. Billets fed into this press are about 36 in. above the floor—a convenient working height



imum the amount of scrap produced as turnings. Billet steel is saved by breaking slugs accurately to forging weight. This practice increases the number of forgings that can be made from a ton of billet steel and reduces the amount of metal turned off of forgings in the rough turning and base facing operations. Gilding metal is saved by reducing the size of the rough bands applied to the shell. This also cuts down the amount of metal to be turned off each band to bring it to size.

Considerable savings in machining time have been effected by using carbide-tipped tools for all turning, facing and boring operations. The only high-speed steel cutting tools used in the machine shop are center drills, cutters used for milling staking notches, drills and taps employed for the lockscrew hole near the nose of the shell, and hobs for cutting the threads in the shell nose for the fuze seat.

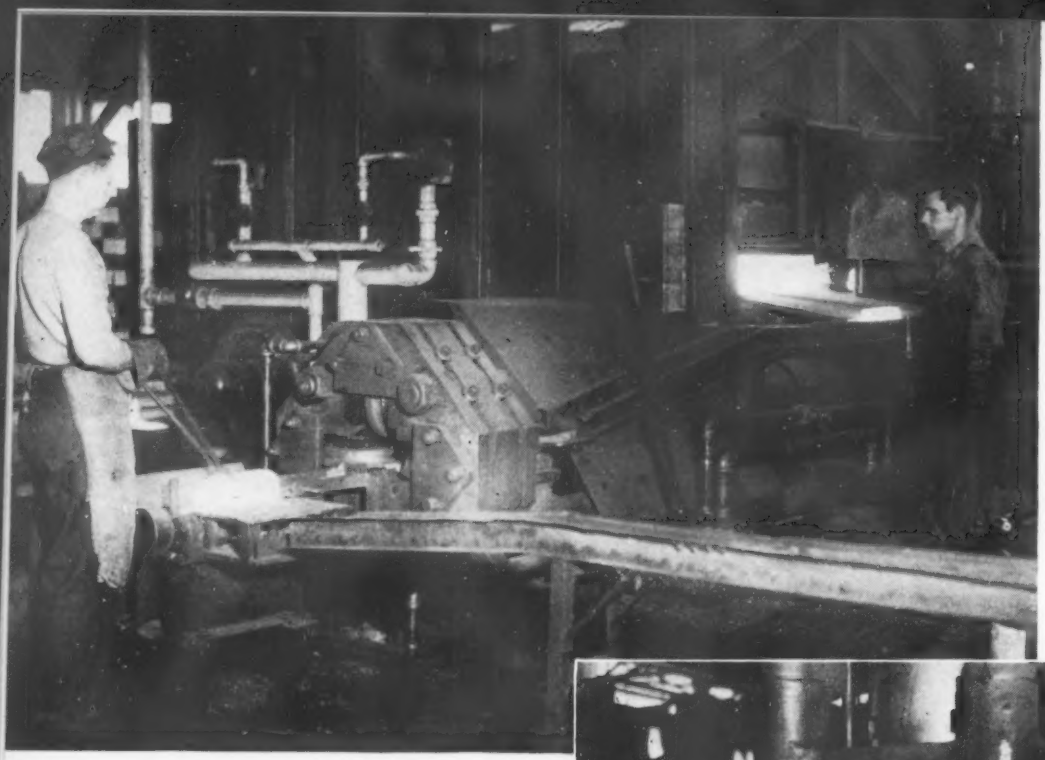
To insure uniform results, every lot of incoming billet steel is examined chemically and metallurgically to permit setting up heat-treating and drawing temperature specifications that will result in shell having the required physical properties and uniform machinability. Once a lot of billets has been accepted by the metallurgical laboratory, the bars are notched with gas torches for breaking into slug lengths. Bars are purchased so that an even number of equal-weight slugs can be broken from each bar. The torch operator burns notches about 2-in. long and $\frac{1}{4}$-in. deep in one side of each 4×4 in. bar at each slug length. Usually about 9 in., the slug length is varied according to the cross-section of the bar, to produce pieces weighing 39-lb. each. This practice insures forging shell bodies of even weight and length, and saves considerable steel over the usual practice of cutting all slugs to the same length regardless of variations in cross-section.

A hydraulic billet-breaking press built by Lansdowne exerts 110-tons upward against the bar at the point where it is notched. Two blocks, carried on a trunnion-mounted pressure bar, bear against the upper surface of the bar at opposite ends of double slug lengths. The trunnion mounting for the pressure bar equalizes the back-up pressure as the ram breaks a slug from the billet.

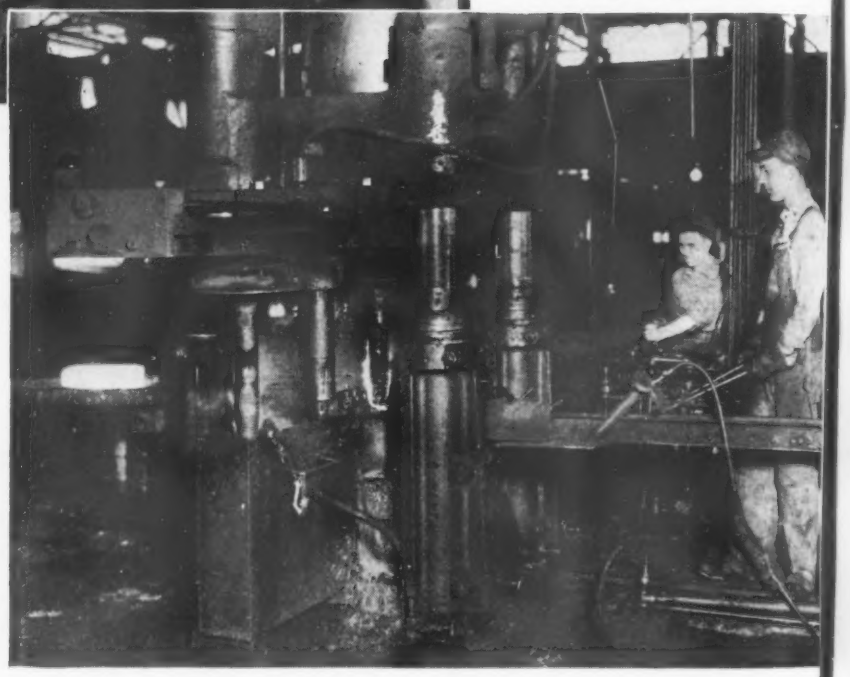
Three men, one operator and two helpers, normally are employed at each breaker press. One helper moves the billets from supporting rails to a roller conveyor and then assists the operator in feeding long billets into the breaker. When the billet is shortened to the point where one man can move it along the conveyor, the helper then secures a second billet. The second helper, stationed at the other side of the machine, inspects the fracture of each slug, stacks slugs on a hand truck and transfers truck loads to the proper furnace. At this point each end of each slug is inspected for defects by Ordnance Department inspectors.

Slugs are heated for forging in Landsdowne-designed furnaces having inclined refractory-brick hearths. The operator at the charging end keeps six rows of slugs moving through the furnace by rolling them down the sloping hearth on their sides, as slugs are rolled from the center of the hearth into the apron at the other end of the furnace by a second operator. Slugs are placed on the upper apron by hand and then rolled into and through the heating zone with long hooked bars. Each slug is in the furnace about two hours, for even heating throughout to about 2,150 F. Each slug is turned 180 deg. each time it is moved to another position down the hearth. Combustion of the natural-gas fuel is regulated to produce a dry scale which is easily broken off before piercing.

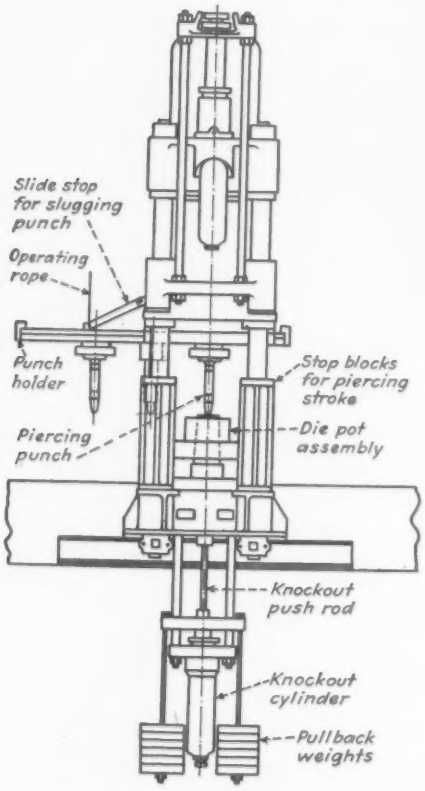
Each forging group consists of a slug-heating furnace, a corner roller, a corrugated-roller descaler, a slugging and piercing press, a single-stage roller-draw bench, a concentricity and length-gaging station and a cooling pit. All of this equipment except the hydraulic piercing press was designed and built by



Most of the work done in making a forged shell body from a hot slug is performed in one of these Birdsboro slugging and piercing presses. At each stroke of the press the two idle punches are cooled by dipping in water



The Lansdowne-designed corner roller sizes the forging slug so it will drop easily into the die pot of the piercing press. It has a 32-in. working stroke



Forgings are slugged and then pierced in a Birdsboro hydraulic press before delivery to a roller draw bench. Press stroke is 14⅜ in.

Lansdowne especially for forging 105-mm. shell bodies.

The corner roller is essentially a single-stage roller draw bench with four 12-in. diameter concave rolls. This machine evens up the diagonals of the slug, making it possible to use billets that vary somewhat in cross-sectional dimensions, particularly billets rolled on a blooming mill. In making 105-mm. shell, the present practice is to set the corner roller to reduce the slug diagonals to a $4\frac{11}{16}$-in. diameter. Since the pot in the piercing press die has an inside diameter of $4\frac{13}{16}$ in., slugs which have been corner rolled will drop into the pot easily.

The operator of the corner roller uses a hooked bar to draw hot slugs off the furnace discharge apron onto a roller conveyor leading to a tiltable tray at the loading side of the machine. By means of a ram exerting 75-tons pressure, the slug is passed through

the four rolls in such position that the diagonals are compressed. The corner roller also breaks up the dry scale, which is removed by tumbling on two corrugated rolls in a descaler.

The Gadsden method of slugging and piercing billets was developed during the last war. In peace-time it has been used advantageously by Lansdowne for forging oil-field fittings. Among the advantages of this method is the fact that slugs are forced to fill the die pot by the slugging punch before the piercing punch is brought into action.

A Birdsboro down-acting hydraulic press is used for slugging and piercing operations. The main ram exerts an effective pressure of 280 tons when connected to a 1,500-lb. per sq.in. hydraulic supply line. The ram acts against continuously energized pushback cylinders to insure rapid return of punches.

A hydraulically indexed punch-holder slide is mounted on the upper platen of the piercing press. The punch holder mounts three tools: a slugging punch in the center, with a piercing punch on either side. These punches are spaced so that the idle ones can be cooled in water tanks at each side of the press. To center one of the three punches above the die pot, the operator traverses the punch holder against a position stop, using control valves at his station. Stops for the piercing punches are located at either end of the slide. The stop for the center slugging punch is hinged so that it can be drawn up out of the way with a rope when the left-hand piercing punch is to be used.

Slugger Punch Minimizes Piercer Wear

When a hot slug has been dropped into the die pot, the press operator indexes the slugging punch into position. During the down stroke, the slugger punch is guided by a slip fit with the top of the die pot. The slugger punch presses the billet to fit the diameter of the pot and brings the top face level, even though the slug might have been broken at an angle. Moreover, the punch produces a $3\frac{3}{4}$ in. deep cavity concentric with the outside diameter of the forging. A cavity in the bottom of the die pot also forms the centering tip at the bottom of the forging.

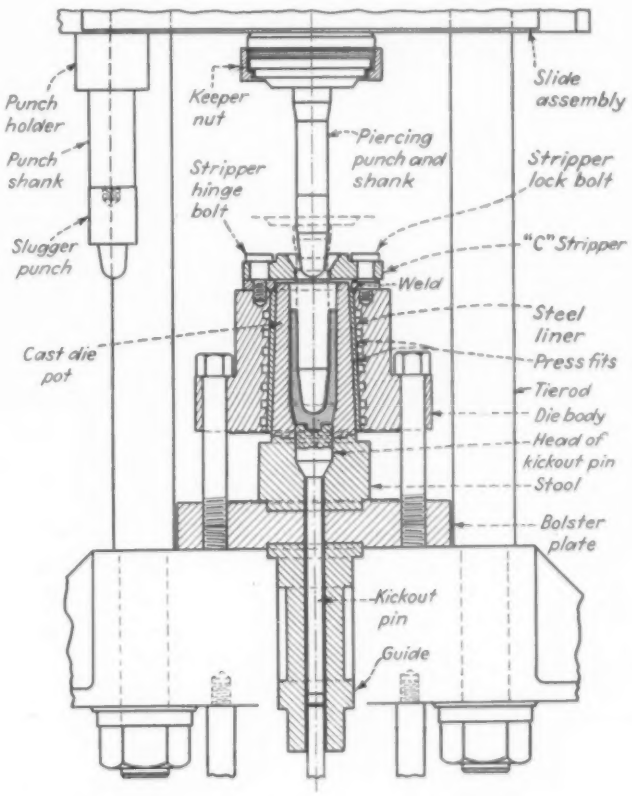
After slugging, the punch-holder slide is indexed to operate one of the piercing punches. Each piercing punch is mounted in a floating holder so that it centers in the cavity formed by the slugging punch to produce a concentric forging. To control base thickness of the forging, the end of the piercing punch is maintained at a predetermined distance from the bottom of the punch holders, and the ram is bottomed against positive stops on the tie rods.

The slugging and piercing punches are lubricated by swabbing with Bunker C fuel oil before each stroke. After slugging, and before the piercing, a small amount of pulverized sea coal is poured into the forging cavity. The heat of the forging causes combustion, leaving a soot coating on the cavity walls to assist lubrication of the piercing punch.

At each press stroke, two of the punches are immersed in the water tank for cooling. Thus, each piercing punch is dipped three times and the slugging punch is immersed once before it is used again. Water in the tanks is continuously changed. This cooling procedure after every cycle has resulted in materially increased punch life.

An hydraulic cylinder operates a knock-out rod to lift the forging for removal with tongs to a roller conveyor. Should a forging stick on the piercing punch it is removed by a swinging stripper positioned by hand. The forgings produced by this method have an outside diameter of $4\frac{15}{16}$ in. and are 13 in. long. The cavity is about $3\frac{3}{8}$ in. in diameter at the open end and is $12\frac{1}{8}$ in. deep. Temperature of the forging when ready for delivery to the roller draw bench is about 1,800-1,850 F.

Slugging punches, piercing punches and knockout pins have been found to have the longest life when made of a chrome tool steel of about the following analysis: carbon, 0.45 percent; manganese, 0.30 per-

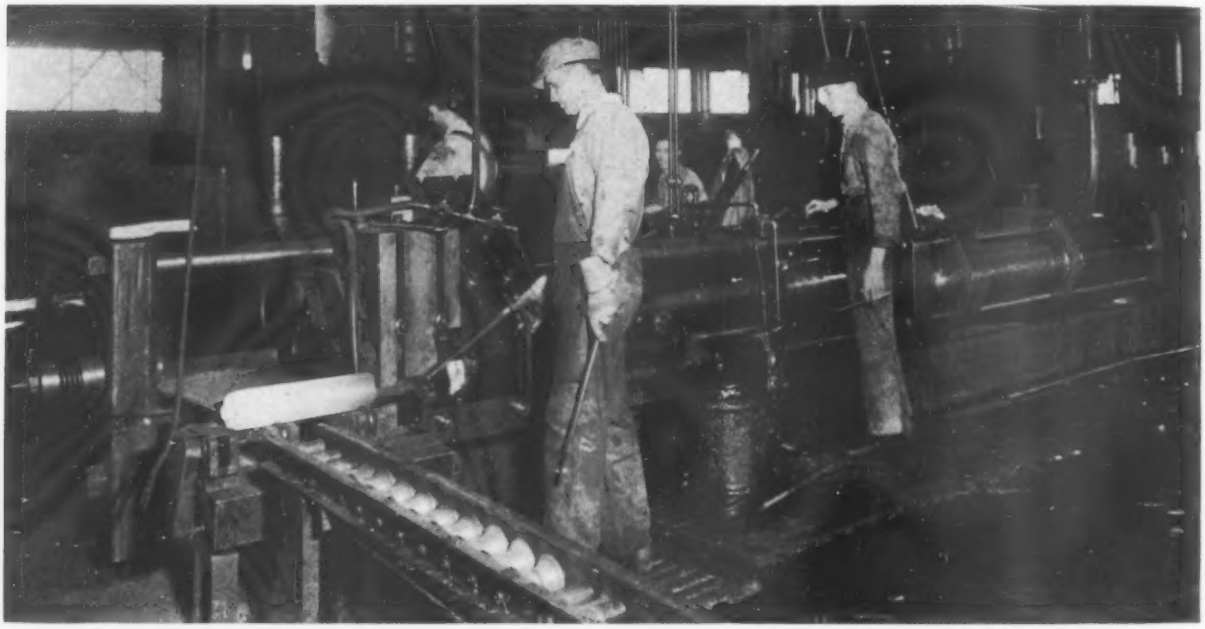


Alloy cast iron die pots have an average life of about 1,600 forgings when water cooled. Pot design is the result of many trials. Floating holders for piercing punches insure punch entering the forging in line with the cavity formed by the slugging punch

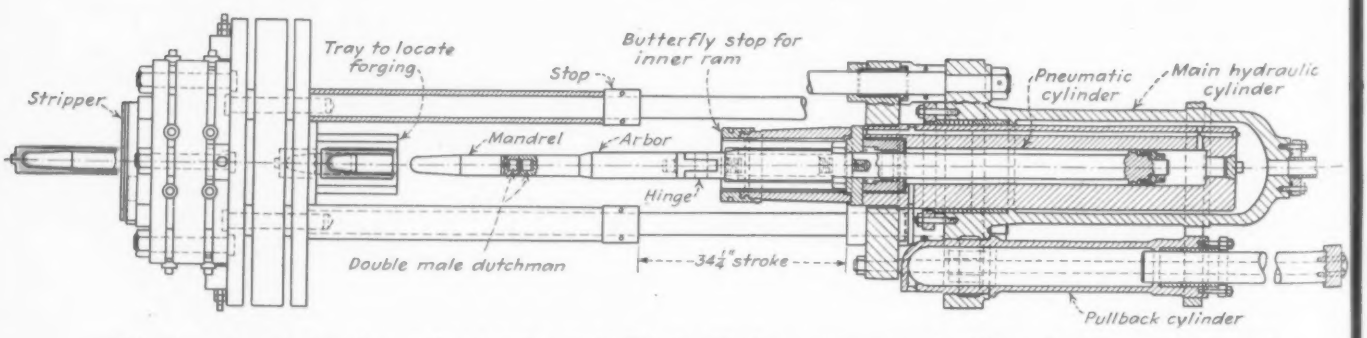
cent; silicon, 1.0 percent; chromium, 5.0 percent; molybdenum, 1.5 percent. No steel containing tungsten can be used because punches cooled by dipping in water crack badly. When made from this steel, slugging punches have an average life of 10,000 to 12,000 forgings, piercing punches last for about 1,500 to 2,000 forgings and the knockout pins are good for about 1,300 forgings between redressings.

Alloy cast-iron die pots have approximately the following composition: total carbon, 3.25 percent; silicon, 1.50; manganese, 0.75; phosphorous, 0.25 maximum; sulphur, 0.15 maximum; nickel, 1.50; molybdenum, 0.50; chromium, 0.50. To attain high resistance to abrasion and heat, especially in the lower third of their length, these pots are cast with the bottom end up and with heavy risers and full heads in order to insure sound metal throughout. These pots are machined for a press fit into a heat-treated steel liner of tapered section, which is pressed into the cast-steel die container and arc welded in position. It has been found that the cast-iron pots will last for about 1,600 forgings.

The Lansdowne-designed roller draw bench employs two rams. The hydraulic main ram exerts a maximum of 83 tons pressure against the forging in forcing it through the rolls. Inside this main ram is a pneumatically operated ram which enters the mandrel in the forging and moves the forging to the first set of four rolls. Before the main ram is brought forward a "butterfly-type" lock is turned behind projections on the pneumatic ram to hold it forward. When the forging leaves the second set of four rolls



A roller draw bench is used to size the shell cavity and extend the forging in length. At the discharge end of the machine is shown the inspection station where concentricity and length of every forging are checked



This draw bench has two roller heads, each fitted with four concave rolls. When the pneumatic ram has moved the mandrel into the forging, the operator rotates a "butterfly stop" to lock it in position in relation to the main hydraulic ram. After the main ram has returned, this stop is released to permit the pneumatic ram to return to its original position and drop the mandrel into a tank of water for cooling

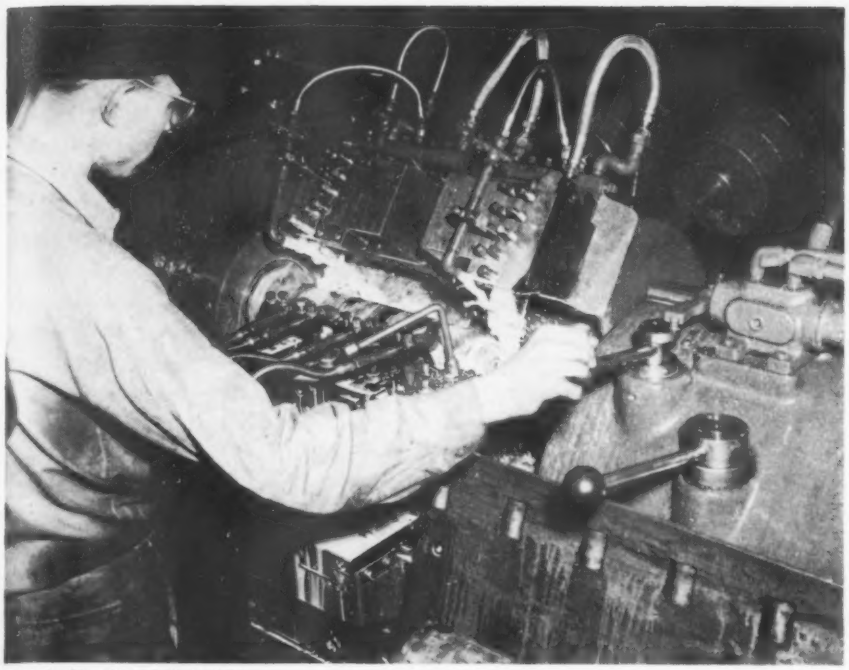
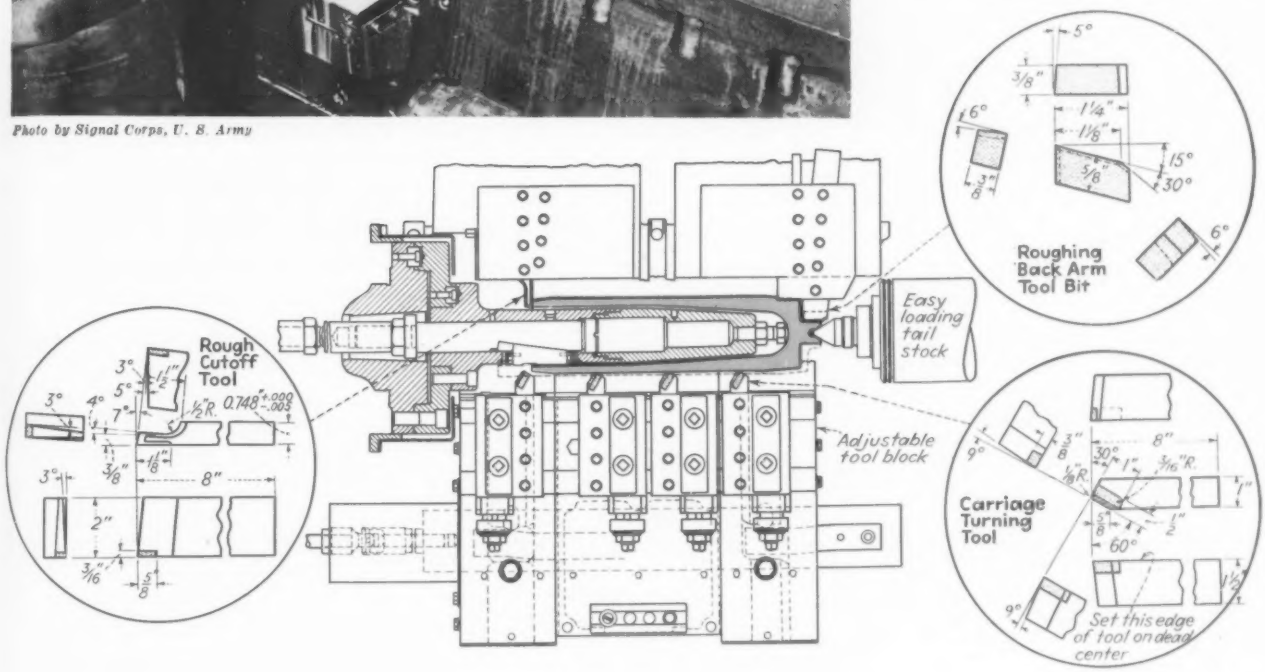


Photo by Signal Corps, U. S. Army

Rough turning, facing and cut-off operations are handled in 16 × 33 in. Fay automatic lathes at a cutting speed of about 310 ft. per min. Coolant is flooded over the carbide-tipped tools during the cutting portion of the cycle

All five tools used for rough turning, facing and cutting off operations on the 16 × 33 Fay lathe are tipped with carbide. A bottleneck form is turned near the nose end to facilitate nosing the shell


Roughing Back Arm Tool Bit
Rough Cutoff Tool
Easy loading tail stock
Adjustable tool block
Carriage Turning Tool
Set this edge of tool on dead center

it moves forward rapidly so that it strikes against a marking anvil at the end of the draw bench.

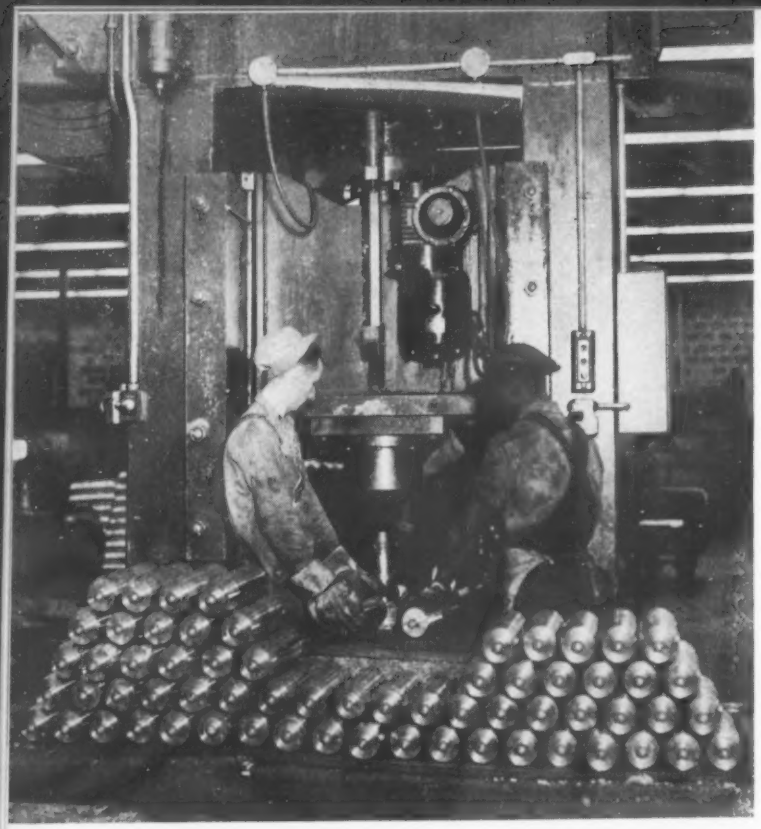
For cooling between drawing cycles, the mandrel arbor is hinged so that the mandrel can drop into a water tank upon the return stroke. At the next cycle a pneumatic cylinder connected to a bellcrank raises the mandrel back into position.

One man operates the draw bench, while a second man removes the forging from the bench and checks it for length and concentricity of cavity. This second man then places the forging on a roller conveyor for delivery by gravity to 5×5×5 ft. steel buckets in a pit for slow cooling. When cool, the forgings are stored according to heat code number until needed.

Experience has shown that draw bench mandrels made of SAE 4140 steel last for about 4,000 to 5,000 forgings, while the forged steel rolls have an average life of about 30,000 forgings between redressings.

The first machining operation on the forged shell body is center drilling the base end on single-purpose units built by Lansdowne. The six-jaw expanding mandrel is operated by a pneumatic cylinder. A 3-hp. motor is connected to the spindle through a gear drive. On the other end of the bed is a hand-fed carriage carrying a motor-driven drill spindle in which the center drill is clamped with a headless setscrew. The drill head unit is mounted on a large trunnion so that it can be swung back out of the way when a forging is to be placed on the mandrel. With the work spindle rotating at 340 r.p.m. and the drill spindle running at 180 r.p.m., about 130 forgings per hour can be center drilled on one of these machines. An air valve operates both the expanding mandrel and the cylinder which swings the drill head into position for drilling, and then back out of the way for loading.

Carbide-tipped single-point tools mounted in former-

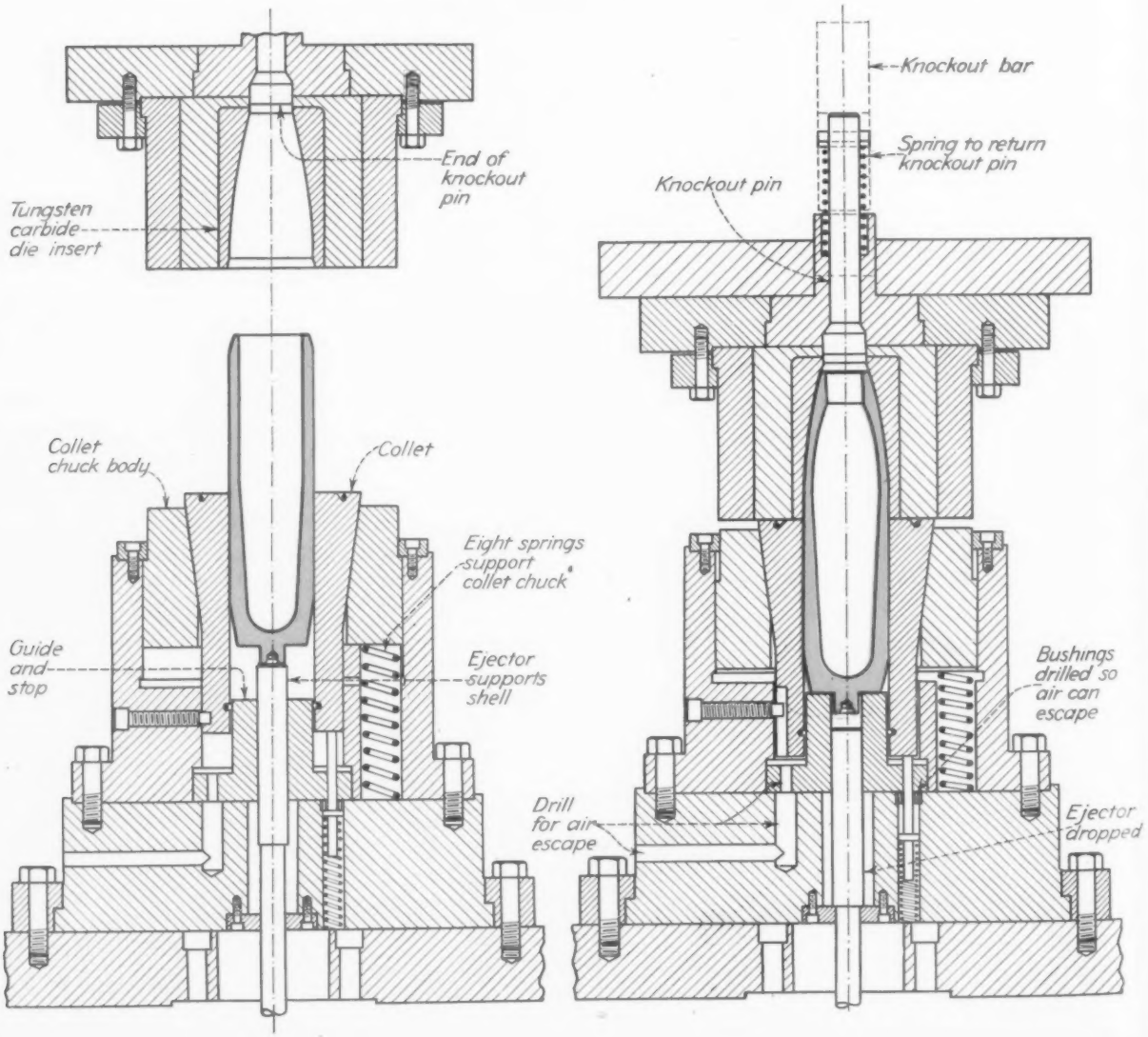


controlled blocks on the front carriage of a 16×33-in. Fay automatic lathe rough turn the tapered boat-tail, the body and the bottleneck form at the nose end on these shell. As four tools are used, the feed of the carriage is only $4\frac{3}{8}$ in. With a 75-hp. motor driving the lathe, spindle speed is 253 r.p.m., giving a cutting speed of approximately 310 ft. per min., and carriage feed is 0.029 in. per rev. When the cutting portion of the cycle is completed, the carriage returns automatically to its starting position, after relieving the tools.

When the carriage starts to return, the back arm starts to feed forward to face the base and to cut off the nose end. Two heavy-shank carbide-tipped tools

Three men work at each Clearing cold nosing press. The operator loads shell into the collet chuck which serves as a lower die. A helper at the front of the press swabs a high-pressure lubricant on the nose section of the next piece

Success of the cold-nosing operation developed for 105-mm. shell has been due largely to the use of a carbide insert in the upper die. Ejectors are provided in both the top and bottom platens



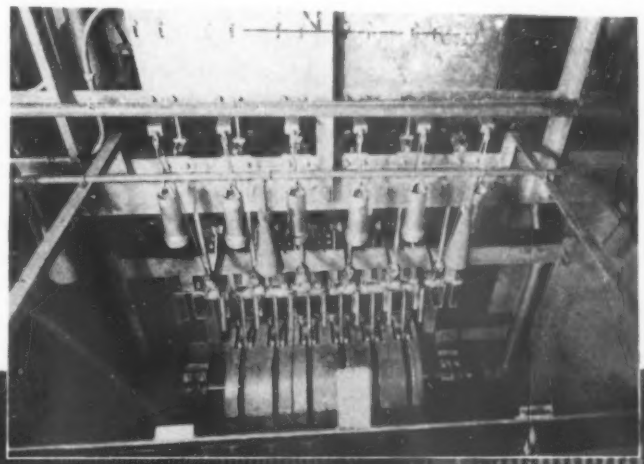
are mounted in blocks on the back arm for these cuts. Rate of feed for the back arm is 0.010 in. per rev. Because of the accuracy with which the forgings are made, only about 8 lb. of steel is removed during rough turning. This involves reducing the outside diameter of the forging about $\frac{1}{4}$ in. Average production for each of these automatic lathes is about 40 shell per hour.

For the rough turning operation, the shell forging is held on a three-jaw hydraulically operated mandrel, locating from the bottom of the finish-forged cavity. The hydraulically-controlled tailstock spindle maintains pressure against the center throughout the turning operation. Soluble oil is used for all machining operations on the shell.

Originally, 105-mm. shell were nosed after heating in induction units. Hot nosing was relatively dirty. Therefore a cold-nosing procedure was developed, using the same 20-in. stroke Clearing "Crankless" 400-ton presses. Average production per press was increased from about 170 shell per hour, when done hot, to 400 shell per hour, when done cold.

Design features of the dies for cold nosing are shown in an accompanying illustration. These dies originally were developed by the General Railway Signal Company. The shell body is placed base-down in a collet chuck that is closed around the shell as the die on the ram is forced over the shell nose. The collet chuck unit centers the shell body and bottoms it against a stop ring. The chuck body floats on heavy-duty die springs, and consequently is not forced against the bottom of the die before the shell bottoms on its stop. Vascalloy-Ramet tungsten-carbide die inserts are fitted into the upper die body to take the full load of the nosing operation. These inserts are $8\frac{3}{8}$ in. long, $5\frac{3}{16}$ in. outside diameter and have an inside diameter of $4\frac{3}{8}$ in. at the large end. There is a hole at the top of the die cavity to permit use of an ejector plug if the shell should stick.

Three men operate each nosing press. One helper, at the front of the press, secures a rough-turned shell body from a stack kept filled by truckers, places it on a stand and swabs the nose with a high-pressure lubricant containing sulphur. The press operator then transfers the shell to the collet chuck and starts the automatic press cycle. When this cycle has been com-



When loading the walking beam table of a Surface Combustion hardening furnace the operator pushes six shell forward on rails until they hit a stop bar. This bar automatically is lifted out of the way when the walking beam raises to carry the six lines of shell forward another station through the furnace. (*Right*) This mechanism in the bottom of the quench tank catches the forgings as they drop from the hardening furnace and automatically sprays inside and outside surfaces with oil

pleted, the second helper, at the rear, places the nosed shell on a pallet. The finish-forged cavity is made slightly under size so that it will be brought to the required diameter when bulged in the cold-nosing operation.

Heat-treating equipment employed in the Gadsden shell plant is similar to that installed at the Frankford Arsenal several years ago. Each heat-treating group consists of a Surface Combustion walking-beam type hardening furnace, an automatic quenching unit and a walking-beam type Surface Combustion draw furnace set in line so that after shell have been loaded on the apron of the hardening furnace they are fed through the furnace, dropped into the quench tank, lifted from the tank and fed into the draw furnace automatically. Six line of shell are moving through the three units of each heat-treating group on a 24-hour a day basis.

The hardening furnace is used at about 1,550 F. for practically all of the steel analyses now being forged. One man loads shell, pushing six forgings against a gage bar to insure that all shell in the row are in line. The gage is raised and lowered automatically by the walking-beam mechanism.

At the discharge end, the shell are dropped through chutes onto spray nozzles at the bottom of the oil quench tank. Around each of these fixed positions are four sets of nozzles which pressure spray the outside surfaces while the center nozzle sprays the cavity. As the cycle progresses, the spray nozzles are turned down mechanically. Shell forgings are removed from the nozzles by drag-link conveyors which raise the forgings from the quench tank slowly, allow them to drain and then deliver them to the walking-beam mechanism feeding the draw furnace. Oil temperature in the quench tank is maintained at about 135 F.

Conveyor-Type Furnaces Handle Shell

Drawing temperatures are varied according to the steel analysis so as to obtain uniform physicals and, just as important, uniform machinability. Ordinarily, draw-furnace temperatures range from 900 to 1,200 F. The equipment is a forced-convection type furnace. Shell are delivered from the draw furnace to six lines of gravity roller conveyors which pass through a cooling tower. Cooling to 150-200 F. is achieved in a relatively few minutes by a powerful exhaust fan. The shell then are lifted by hand to a cross conveyor for delivery to a Gogan hardness tester. Every shell is checked at this machine, the operator transferring and checking the hardness of about 120 shell per hour.

The shell are heat-treated within the hardness range of 229 to 248 Brinell. One of the hardest and one of the softest shell from each heat is set aside for physical tests.

To keep the noise, dust and grit of the shotblasting machines away from the machine shop and the heat-treating department, these units are housed in portable sheds in the yard. Two four-station Pangborn shotblasting machines and three American rotary units especially designed for cleaning the cavities of heat-treated shell are located in each of these sheds.

After shotblasting, the shell are returned to the machine shop for finishing operations. First, the open nose of each shell is bored, faced and chamfered in Model 10 Sundstrand automatic lathes, at the rate of one piece per minute. The tools consist of a rough boring bit which bores the nose to a diameter of $1\frac{7}{8}$ in., a finish boring bit to enlarge the nose diameter to $1\frac{29}{32}$ in. and a chamfering tool bit, all three being mounted in a Davis boring bar held in a toolblock on the front carriage. In the same toolblock, mounted beside the boring bar, is a facing tool which takes a plunge cut at the same time that the chamfering bit is finishing its cut. All four of these tools are tipped with tungsten carbide to insure long tool life.

Quick-Action Chucks Speed Machining

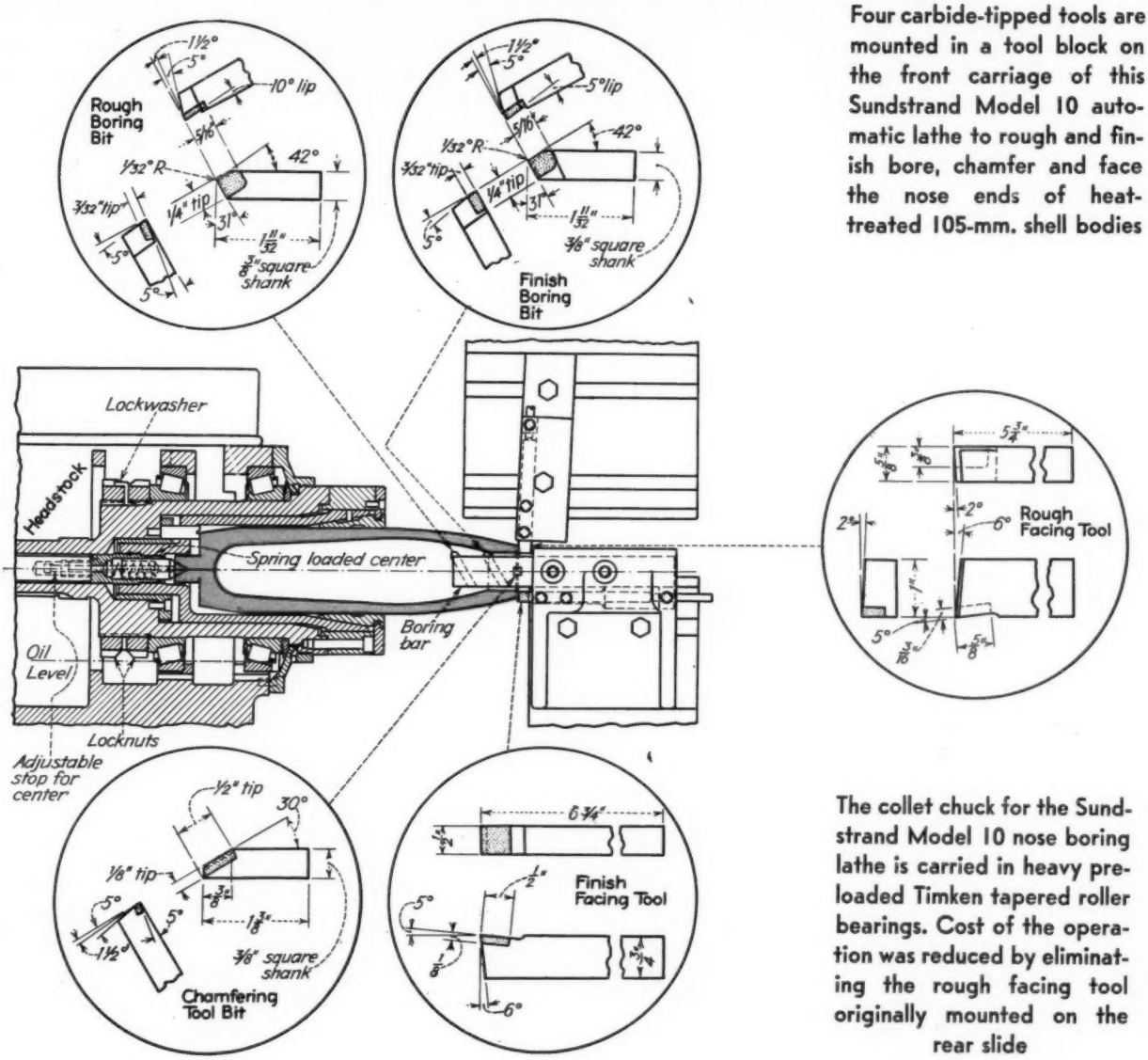
The shell is gripped in an air-operated collet chuck and the base is centered by contact with a spring loaded center in the bottom of the chuck. A 10-hp. motor drives the lathe spindle, which is rotated at 454 r.p.m. The tools are fed in an automatic cycle of rapid advance, feed at 0.014 in. per rev., and rapid return to the starting position.

The next operation consists of finish turning the tapered boat-tail, the body and the ogive with three carbide-tipped tools on the front carriage of a 12-in. Fay automatic lathe and then, in the same operation, finish turning the front and rear bourrelets with two carbide-tipped tools mounted in adjustable blocks on the back arm of the lathe. All three tools on the front carriage are mounted in toolblocks on taper turner slides that are controlled by a form bar. The back arm takes a straight cut to finish the 4.128-in. diameter bourrelets.

The nose of the shell is centered and driven by a four-jaw expanding mandrel connected by heavy draw-rod to a 12-in. Skinner air cylinder. The base of the shell is supported on a ball-bearing center in the pneumatically operated tailstock spindle. To load the machine, the operator places the finish-bored nose of a shell on the mandrel and then lowers the body onto a loading bracket. By manipulating an air valve, the operator brings the tail-stock spindle forward to engage the center. This lifts the shell body off the loading bracket, providing sufficient clearance to prevent damage from chips.

A 30-hp. motor drives the spindle at 320 r.p.m., so that the cutting speed is 350 ft. per min. Feed per revolution for both the front carriage and the back-arm slide is 0.023 in. The front carriage feeds forward

Four carbide-tipped tools are mounted in a tool block on the front carriage of this Sundstrand Model 10 automatic lathe to rough and finish bore, chamfer and face the nose ends of heat-treated 105-mm. shell bodies



The collet chuck for the Sundstrand Model 10 nose boring lathe is carried in heavy preloaded Timken tapered roller bearings. Cost of the operation was reduced by eliminating the rough facing tool originally mounted on the rear slide

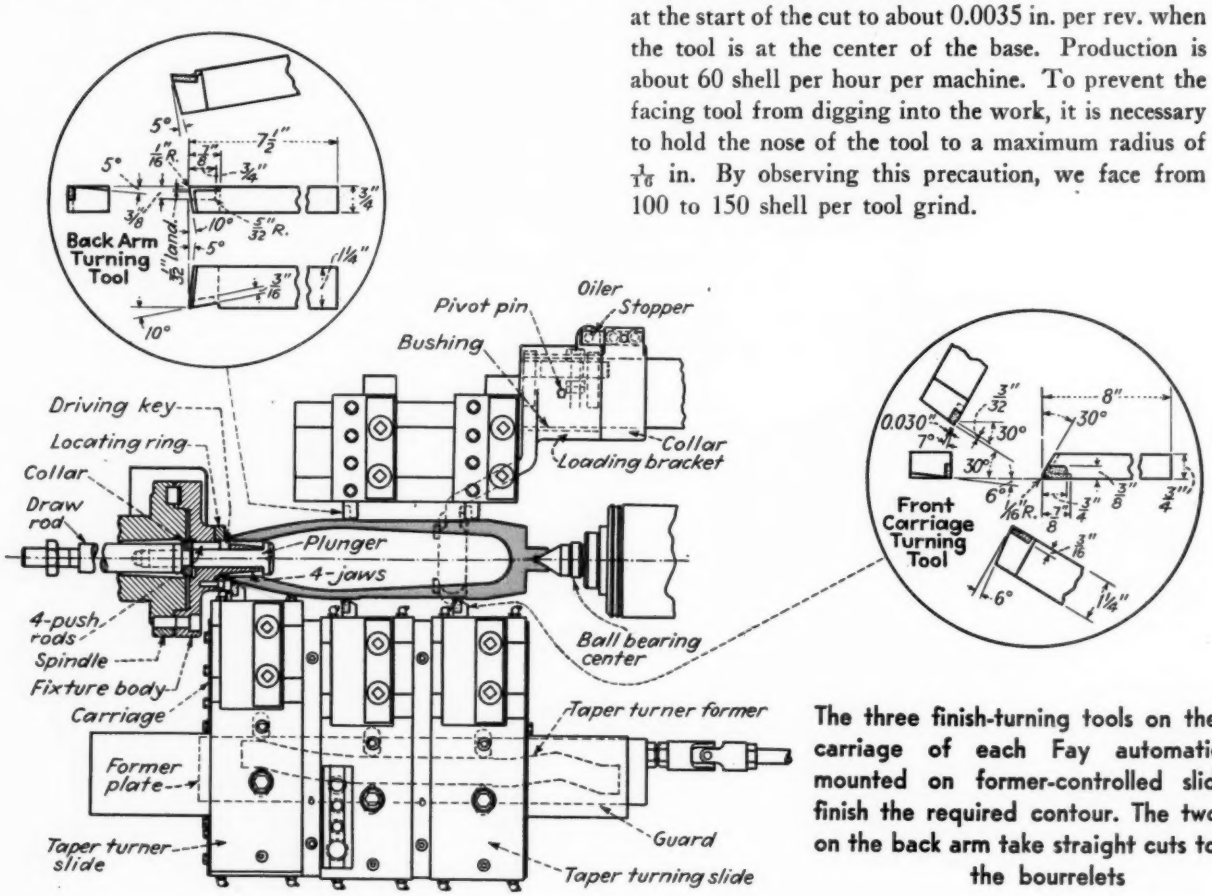
Shell are finish turned in 12 × 21 in. Fay automatic lathes, using three carbide tipped tools on the front carriage and two similar tools on the back arm

about 6½ in. during an automatic cycle of rapid advance, feed, relieve and return at an accelerated rate. Then, the back arm swings into position and the two rear tools are fed longitudinally about 1⅛ in. to finish the bourrelets. Under average conditions, output is about 45 shell per hour per machine.

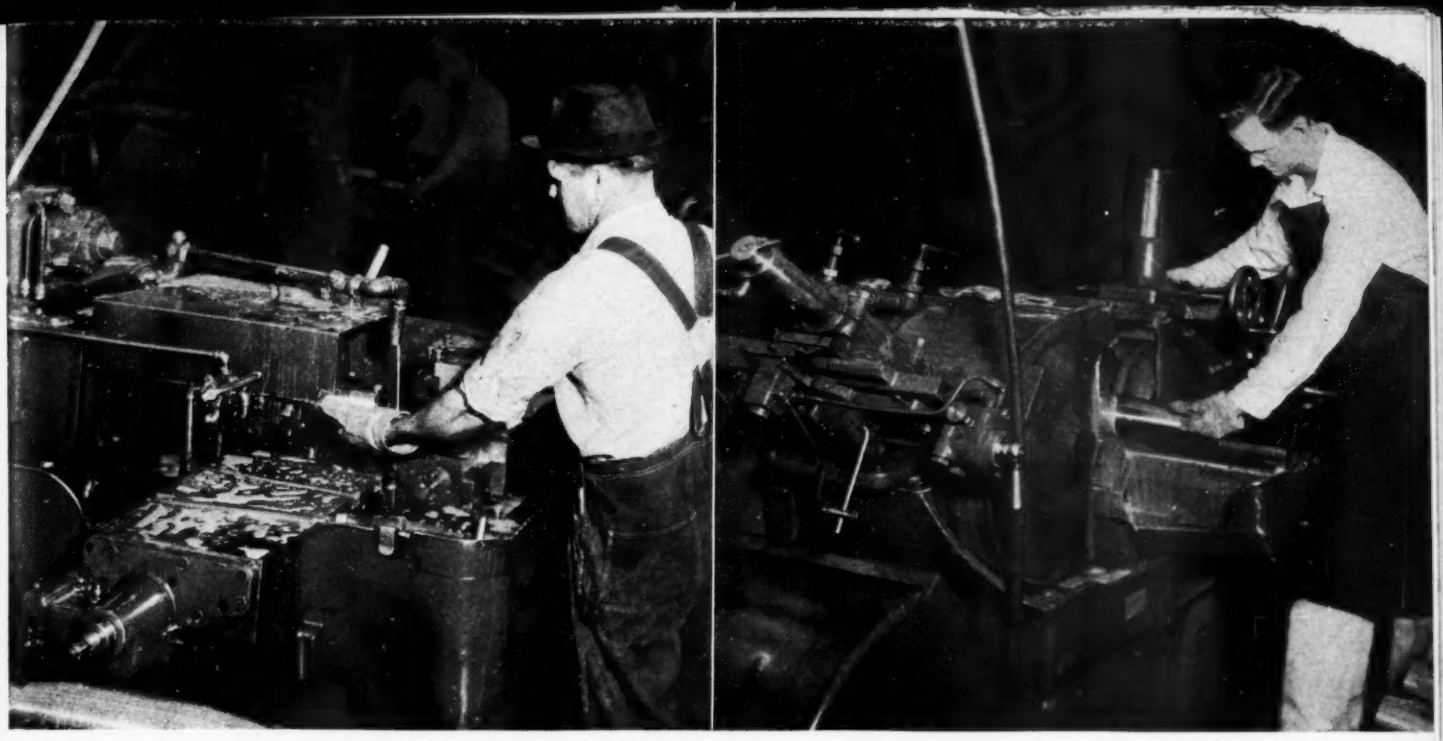
In the original production layout, No. 12 Gisholt automatic lathes were tooled to cut off the center boss on the base end, finish face the base end, and rough and finish the band groove and crimping chamfer. As experience was gained in the use of this machine, it was found that the quality of the band groove could be improved by cutting off the center boss and finish facing the base end in a separate operation. For this operation, two carbide-tipped tools are mounted in one toolblock on the rear slide, so that the boss is cut off and the base is faced at the same time. The toolblock used is arranged so that the tools can be swung away from the work by hand when the finish facing cut has been completed and the slide is rapid traversed back to its starting position. Then, the shell are delivered to other No. 12 Gisholt automatic lathes equipped only with carbide-tipped forming tools for finishing the band groove and chamfer.

Both of the Gisholt lathes used for base-end operations employ the same type of collet chuck (supported by a steadyrest) for locating and driving the shell. The shell is pushed against a stop to locate from the bottom of the cavity. At the same time the open nose slips over a tapered spring-loaded bushing on the stop rod to insure that the base and the band groove will be machined square with the shell axis.

The lathe is driven by a 10-hp. motor, has a spindle speed of 325 r.p.m., and the rear tool slide is fed by cam at a varying rate reducing from 0.075 in. per rev. at the start of the cut to about 0.0035 in. per rev. when the tool is at the center of the base. Production is about 60 shell per hour per machine. To prevent the facing tool from digging into the work, it is necessary to hold the nose of the tool to a maximum radius of $\frac{1}{16}$ in. By observing this precaution, we face from 100 to 150 shell per tool grind.



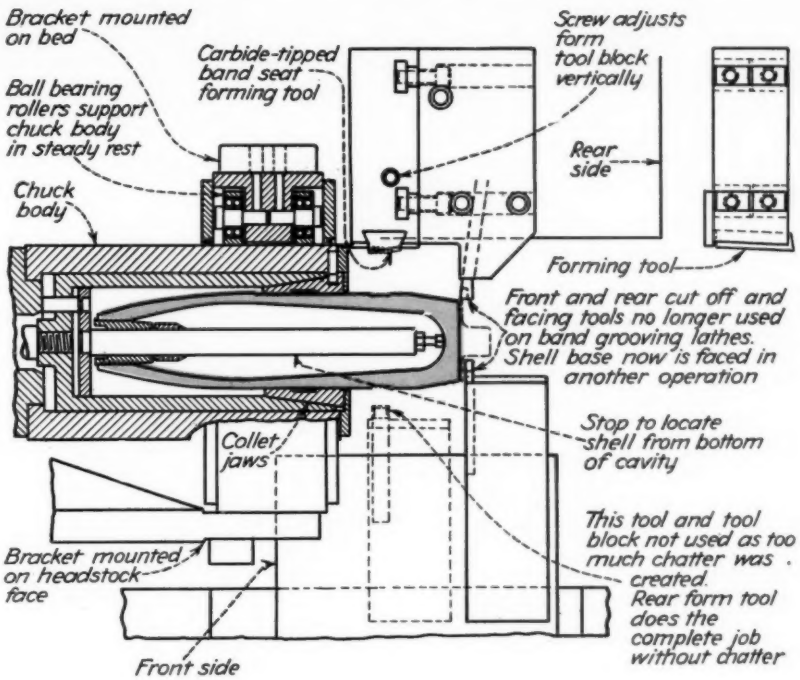
The three finish-turning tools on the front carriage of each Fay automatic are mounted on former-controlled slides to finish the required contour. The two tools on the back arm take straight cuts to finish the bourrelets



Finish-turned shell are delivered by truck to No. 12 Gisholt automatic lathes for a base facing operation, as shown above, and then roll down a conveyor line to similar lathes where the band grooves are formed

The collet chuck used in the No. 12 Gisholt lathe is fitted to the spindle nose and is supported in a ball bearing steadyrest. A single carbide-tipped form tool is now used to form the band groove and crimping chamfer

Shell are handled one at a time for centerless grinding the front and rear bourrelet diameters to plus or minus 0.002 in. Compartments in the shell trucks protect the ground surfaces


Bracket mounted on bed
Carbide-tipped band seat forming tool
Screw adjusts form tool block vertically
Ball bearing rollers support chuck body in steady rest
Rear side
Chuck body
Forming tool
Front and rear cut off and facing tools no longer used on band grooving lathes. Shell base now is faced in another operation
Stop to locate shell from bottom of cavity
Collet jaws
This tool and tool block not used as too much chatter was created. Rear form tool does the complete job without chatter
Bracket mounted on headstock face
Front side

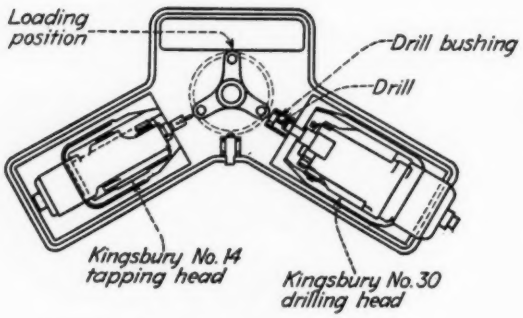
Good tool life—about 300 shell per grind—is experienced with the carbide-tipped form tool used for the band groove and crimping chamfer. The automatic lathe is driven by a 10-hp. motor at a spindle speed of 415 r.p.m. The automatic cycle averages about 100 shell per hour. By setting the form tool 0.010 to 0.015 in. above center, tool life is improved. The chipping and rapid breakdown of the carbide cutting edge experienced when the tools were set on center has been almost eliminated.

Cincinnati No. 2 centerless grinders finish the front and rear bourrelet diameters by the infeed method. Two sets of regulating and grinding wheels are used, because the narrow bourrelets are some distance apart. Standard practice is to use 12-in. regulating wheels and 20-in. grinding wheels. About 150 shell can be ground for each dressing of a pair of grinding wheels.

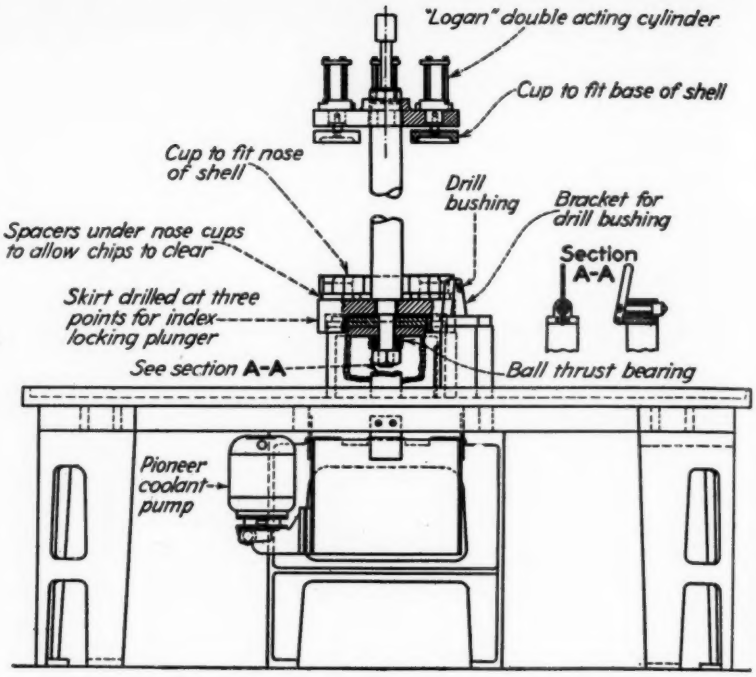
Approximately 0.007 in. of stock is left on the bourrelet diameters in the finish turning operation. These diameters must be ground with ±0.002 in. of specified diameters, and to a good finish. Vitrified-bond, aluminum-oxide wheels of about 60 grit are used for grinding. Regulating wheel speed is 39 r.p.m., grinding-wheel speed, 1,100 r.p.m. When soft wheels are encountered, the regulating wheel speed is reduced to 22 r.p.m. When grinding at a rate of approximately 175 shell per hour, a set of wheels will last for a total of 60,000 shell.

Finish ground shell are replaced in the compartments of the special floor trucks so that the bourrelets will not be damaged by coming in contact with other shell. When loaded with ground shell, the truck is

Pneumatic clamps hold the shell in position in a vertical hand-indexed fixture for drilling and tapping the lockscrew hole. The cycle of each of the machine heads is automatic



Layout of Units on Table of Machine


"Logan" double acting cylinder
Cup to fit base of shell
Cup to fit nose of shell
Drill bushing
Bracket for drill bushing
Spacers under nose cups to allow chips to clear
Section A-A
Skirt drilled at three points for index-locking plunger
See section A-A
Ball thrust bearing
Pioneer coolant pump

Assembly of Lockscrew Hole Drilling and Tapping Machine

moved to an ordnance inspection bench where all finished surfaces on each shell are checked.

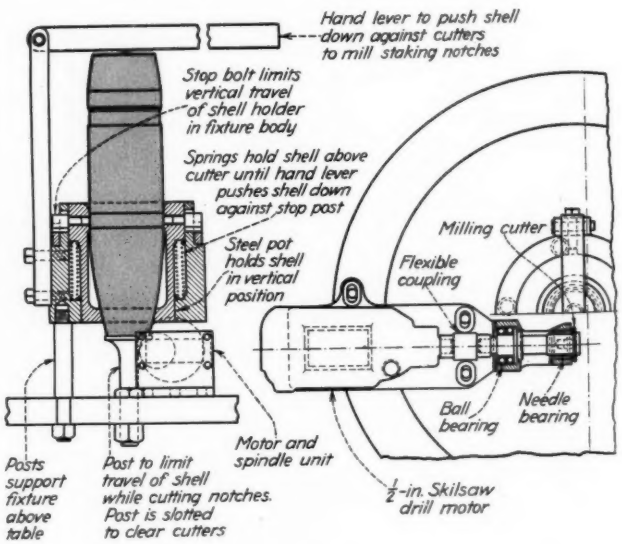
Beside each inspection bench is a Lansdowne-designed, hand-indexing, automatic-cycle drilling and tapping machine for finishing a lockscrew hole near the nose end of each shell. This machine consists essentially of a three-position fixture set vertically on an index table and two unit heads, one for drilling and the other for tapping. Each position of the fixture has a cone at the bottom for locating the nose end of the shell. At the upper end of the fixture are three pneumatic cylinders, each above one of the cones on the index table. Attached to the ram of each cylinder is a steel cup machined to fit snugly over the finished base of a shell.

The actual drilling cycle requires 0.27 min., using a 0.261 in. diameter drill. The $\frac{5}{16}$ in.-18 tapping cycle requires 0.07 min. A three-flute gun tap is used to give a longer life. One of these machines averages about 150 shell per hour. Experience has shown that a drill will last for about 700 to 750 shell in this machine, while a tap is good for about 275 to 300 shell.

Shell next are knurled in the band groove and stenciled with identifying data on the body at the rate of about 1,200 shell per eight-hour day, or an average of 150 shell per hour, in a small machine designed and built by Lansdowne. A limit switch controls rotation of the knurling roll to one revolution per cycle. The knurling roll and its drive sprocket are mounted on a sleeve that turns on an eccentric shaft which is connected to a weighted lever arm to provide the pressure necessary to cut knurls in the band groove. Directly under the shell when in position for knurling is a marking roll.

When a shell has been knurled, it is placed nose down in another Lansdowne-designed machine for milling the five staking notches in the nose end. For this operation 2-in. diameter $\frac{3}{16}$ in. wide convexing milling cutters are carried on spindles connected by flexible couplings to motors from standard ½-in. portable power drills. The fixture floats on springs thereby requiring a hand lever to force the shell down against the milling cutters.

A No. 2 West tire setter is used to apply the gilding-metal rotating bands to the band grooves. Three pressure strokes are applied to each band. Between each stroke the shell is rotated in the dies approximately 30 deg., and each stroke is held on until the


Hand lever to push shell down against cutters to mill staking notches
Stop bolt limits vertical travel of shell holder in fixture body
Springs hold shell above cutter until hand lever pushes shell down against stop post
Steel pot holds shell in vertical position
Milling cutter
Flexible coupling
Ball bearing
Needle bearing
Motor and spindle unit
Posts support fixture above table
Post to limit travel of shell while cutting notches. Post is slotted to clear cutters
½-in. Skilsaw drill motor

Notching cutters are carried on ball-bearing spindles connected to the drill motors by flexible couplings. Forcing the shell nose down against a stop insures even depth for all notches

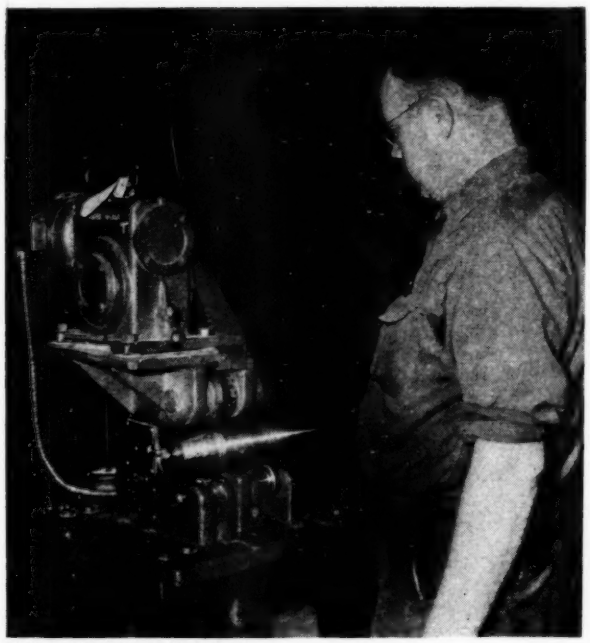


Photo by Signal Corps, U. S. Army

Lansdowne built this special machine for knurling the band grooves and stenciling identifying data on the body of the shell

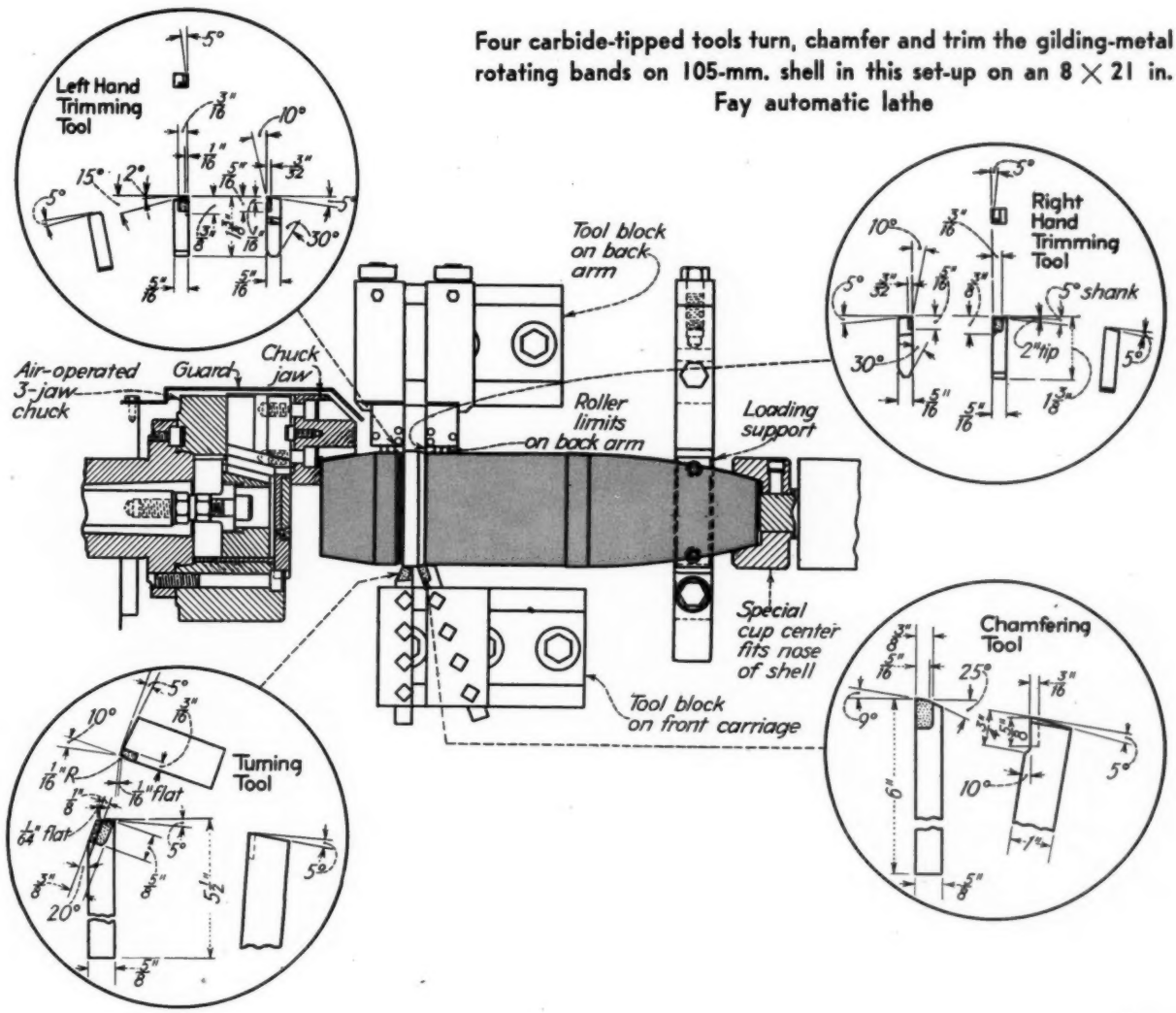
gage pressure reaches 1,200 lb. Output is 150 shell per hour per machine.

Rotating bands are finish turned to form and size in 8×21 in. Fay automatic lathes to which the shell are delivered by gravity roller conveyor lines from the banding presses. The base end of the shell is gripped in a three-jaw pneumatically operated chuck, while the nose end is centered in a cup mounted on the ball-bearing spindle in the tailstock. One air valve controls the cylinders operating the three-jaw chuck and the tailstock spindle.

As in all other machining operations in this plant, carbide-tipped tools are employed in each of these band-turning machines. Two tools are mounted in a block on the front carriage to finish turn the outside diameter of the band and to cut a chamfer at the front end. While these tools are cutting, the back arm is fed forward to bring two trimming tools into position to finish each end of the band.

Originally this operation was done at 578 r.p.m., giving a cutting speed of 670 ft. per min. With a 0.008 in. feed, hourly production was 75 shell. By speeding up the lathe to 720 r.p.m., and by improving operator efficiency, the output per machine has

Four carbide-tipped tools turn, chamfer and trim the gilding-metal rotating bands on 105-mm. shell in this set-up on an 8 × 21 in. Fay automatic lathe



been increased to 100 shell per hour. Finished shell are carried away from each band turning lathe by gravity roller conveyor lines equipped with wooden rollers, so that the finished bands will not be damaged.

The next operation consists of milling the 2-in. 12NS-1 thread in the nose for the fuze seat. This operation is performed in Lees-Bradner thread milling machines equipped with a special work-holding fixture to minimize loading and unloading time. These fixtures employ a pneumatic cylinder to hold the shell tightly in position after the fixture clamp bar has been locked.

To speed up inspection of the milled thread, a driving unit has been developed by which the shell is rotated slowly forward, so that the hand-held gage can be threaded into the piece without much effort. When the gage has been inserted far enough, another head is brought down and a friction drive wheel rotates the shell in the opposite direction to remove the gage.

A gravity roller conveyor carries inspected shell to a group of Thomson-Gibb seam welding machines for applying the sheet-metal baseplate. Government inspection follows. Another labor-saving device is a Toledo dial scale with a roller conveyor section. Thus, an inspector can sit in front of the dial and check the weight of each shell as it passes over the conveyor section.

Conveyor lines carrying shell past the government inspection station deliver them to Blakeslee Niagara-type metal washing machines where each shell is thoroughly cleaned with a solution made up by mixing 8 lb. of caustic soda to 400 gal. of water. The cleaning solution and the rinse water sprayed on the shell are held at a temperature of 175 F. so that the warm shell will dry rapidly. The conveyor hangers carrying the shell nosedown through this machine are mounted on 12-in. centers and travel at a rate of about 8 ft. per min.

Shell emerging from the washing machine are transferred by hand to belt conveyors where girls insert and tighten the lockscrews in holes previously drilled and tapped. These screws are inserted while the constantly moving conveyor line is carrying the shell past the workers.

DeVilbiss automatic paint spraying machines coat the interior and exterior surfaces of each shell. The belt conveyor carrying painted shell away from the spray coating machines first takes them to a government inspector who checks the quality of the painted surfaces, and then to a packing station where two shells are inserted in a cardboard carton.

Threads in the nose of each shell are milled rapidly in Lees-Bradner machines. Hob speed is 308 r. p. m. A complete cycle, including handling time, requires about two minutes

Wichita City Library

TIME-DATA SHEET NO. 40

Radial Drill Press Operations—V

Material Handling:

No time is allowed in the formula for handling material to or from machines. This should be taken care of by a moveman. Material should be placed as close to the machines as possible, but in such a position that it will not interfere with the movements of the operator. The movemen may or may not be included in the machining groups, depending on whether or not it is the policy to include expense labor with productive labor. In case his time is to be included in the groups, an allowance should be made to take care of it. All parts weighing over 75 lb. should be routed to a machine served by a jib crane or an over-head crane.

Group Leader:

The group leader assigns the work to the operator, and should plan the work so that each operator has a job ahead of him. He should see that the operator has the proper information, drawings, materials and tools before starting the job; and should arrange the work so that the job will be given to the operator or machine best fitted to handle it. The group leader by observing these duties will increase the efficiency and earnings of the group.

In a group, the group leader ordinarily performs a number of tasks which were formerly done by the individual workers, and his time is taken care of by the standard allowances. These allowances (such as: get drawing, tools, jigs and time slips; and make partial set-ups) occur in each set-up time allowance. In small groups, where supervisory duties do not constitute a days work, the group leader should be given a machine and he should participate in actual production work.

Inspection:

Time is allowed in the set-up allowance for taking the first piece to the inspector, and going to the inspector's bench after he has inspected it. No time is allowed the operator to wait for the inspector. It is believed it is better for the operator to continue with the job while the piece is being inspected. The chances of spoiling the work, and the resulting loss, is in most cases less than the loss occurring as a result of each operator waiting for the inspector each time he starts a new job. A good operator should not rely on the inspector, but should be reasonably certain in his own mind that the job is correct.

Scope of Formula:

This formula was made to cover 3-, 4-, 5- and 6-ft. swing radial drill presses as there is not sufficient difference in the operation of these machines to warrant a separate formula being made for each size. It is recognized that the time required to set up and operate a 6-ft. radial drill press may be slightly more in some cases than for the smaller 3- or 4-ft. sizes. To avoid a complicated formula, an average time was used. This is sufficiently accurate for these constants.

Cleaning and Oiling:

Each operator should keep his machine cleaned and oiled. For this purpose an allowance of 0.20 hr. is made daily for

Table No. 4—Time To Drill Bronze Alloys

(Peripheral Speed — 90 Ft. Per Min.)

Drill Size	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3
R.P.M.	1200	916	688	458	344	274	230	196	172	153	138	125	114
Feed	0.006	0.009	0.012	0.012	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Drill Lead	0.075	0.113	0.150	0.225	0.300	0.376	0.451	0.526	0.600	0.675	0.750	0.825	0.900
Depth	Allowed time in decimal hours (includes drill lead)												
1/8	0.0005	0.0005	0.0006	0.0012	0.0016	0.0024	0.0032	0.0043	0.0054	0.0067	0.0081	0.0097	0.0115
1/4	0.0007	0.0008	0.0009	0.0017	0.0021	0.0029	0.0039	0.0051	0.0063	0.0078	0.0093	0.0109	0.0129
3/8	0.0012	0.0011	0.0012	0.0021	0.0026	0.0035	0.0046	0.0059	0.0072	0.0088	0.0105	0.0122	0.0143
1/2	0.0016	0.0014	0.0015	0.0025	0.0030	0.0041	0.0053	0.0068	0.0081	0.0099	0.0116	0.0135	0.0157
5/8	0.0019	0.0017	0.0018	0.0030	0.0035	0.0047	0.0060	0.0076	0.0091	0.0109	0.0128	0.0148	0.0171
3/4	0.0022	0.0020	0.0021	0.0034	0.0040	0.0053	0.0067	0.0084	0.0100	0.0120	0.0140	0.0161	0.0185
7/8	0.0026	0.0023	0.0024	0.0039	0.0045	0.0059	0.0074	0.0092	0.0109	0.0130	0.0152	0.0173	0.0199
1	0.0028	0.0025	0.0026	0.0043	0.0049	0.0065	0.0081	0.0101	0.0118	0.0141	0.0163	0.0186	0.0213
1 1/8	0.0032	0.0028	0.0029	0.0047	0.0054	0.0071	0.0088	0.0109	0.0128	0.0151	0.0175	0.0199	0.0227
1 1/4	0.0035	0.0031	0.0032	0.0052	0.0059	0.0077	0.0095	0.0117	0.0137	0.0162	0.0186	0.0212	0.0241
1 3/8	0.0038	0.0034	0.0035	0.0056	0.0064	0.0082	0.0102	0.0125	0.0146	0.0172	0.0198	0.0224	0.0255
1 1/2	0.0043	0.0037	0.0038	0.0061	0.0068	0.0088	0.0109	0.0134	0.0155	0.0183	0.0209	0.0237	0.0269
1 3/4	0.0049	0.0043	0.0044	0.0069	0.0078	0.0100	0.0123	0.0150	0.0174	0.0204	0.0233	0.0263	0.0297
2	0.0056	0.0048	0.0050	0.0077	0.0087	0.0112	0.0137	0.0167	0.0192	0.0225	0.0256	0.0288	0.0325
2 1/4	0.0061	0.0054	0.0055	0.0087	0.0097	0.0124	0.0151	0.0183	0.0211	0.0246	0.0279	0.0314	0.0353
2 1/2	0.0070	0.0060	0.0061	0.0095	0.0106	0.0135	0.0165	0.0200	0.0229	0.0267	0.0302	0.0340	0.0380
2 3/4	0.0076	0.0066	0.0067	0.0104	0.0116	0.0147	0.0179	0.0216	0.0248	0.0288	0.0325	0.0365	0.0408
3	0.0083	0.0071	0.0072	0.0113	0.0125	0.0159	0.0193	0.0233	0.0266	0.0309	0.0349	0.0390	0.0437
3 1/4	0.0089	0.0077	0.0078	0.0122	0.0135	0.0171	0.0207	0.0250	0.0285	0.0330	0.0372	0.0416	0.0465
3 1/2	0.0097	0.0083	0.0084	0.0130	0.0144	0.0182	0.0221	0.0266	0.0303	0.0351	0.0395	0.0442	0.0493
3 3/4	0.0103	0.0089	0.0090	0.0139	0.0154	0.0194	0.0235	0.0282	0.0322	0.0372	0.0419	0.0467	0.0521
4	0.0110	0.0094	0.0095	0.0148	0.0163	0.0206	0.0249	0.0299	0.0340	0.0393	0.0442	0.0493	0.0548
4 1/4	0.0115	0.0100	0.0101	0.0157	0.0173	0.0218	0.0263	0.0316	0.0359	0.0414	0.0465	0.0518	0.0577
4 1/2	0.0123	0.0106	0.0107	0.0165	0.0182	0.0229	0.0277	0.0332	0.0377	0.0435	0.0488	0.0544	0.0605
4 3/4	0.0130	0.0112	0.0113	0.0174	0.0192	0.0241	0.0291	0.0348	0.0396	0.0456	0.0511	0.0569	0.0633
5	0.0137	0.0118	0.0118	0.0183	0.0201	0.0253	0.0305	0.0365	0.0414	0.0477	0.0535	0.0595	0.0661
Per Inch	0.0027	0.0023	0.0023	0.0035	0.0038	0.0047	0.0056	0.0066	0.0074	0.0084	0.0093	0.0102	0.0112

A tribute to

WEBBER CRAFTSMANSHIP

● The recent award of the ARMY-NAVY "E" to Webber Gage Company (only manufacturer thus honored for production of Gage Blocks) is in reality a tribute to superlative craftsmanship.

A craftsmanship rich in skill that comes from tediously working with tolerances until recently believed impossible of attainment.

Dealing in millionths of an inch is no new experience to the craftsmen of the Webber Gage Co. These are every day working tolerances for the men responsible for the dependable accuracy of Webber Gage Blocks.

Receiving this recognition for excellence both in accuracy and outstanding production will not only serve as an inspiration to maintain present schedules but to strive to attain new "highs" both in production and tolerances.

If you are not now using Webber Gages investigate the many advantages of using them on every step of your production from machine operations to final inspection.

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For the duration Webber's entire productive capacity is being devoted to the manufacture of GRADE A GAGE BLOCKS only.

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Webber
GAGE COMPANY
12901 TRISKETT RD., CLEVELAND, OHIO

●

Prompt delivery to firms furnishing necessary priority certificates.
Prices for Set No. 81A—$350.00
Set No. 40A—$185.00

●

TIME-DATA SHEET NO. 41

Radial Drill Press Operations—VI

oiling, and 0.42 hr. weekly for cleaning. Total weekly allowance for oiling is 5×0.20 hr., or 1.00 hr. Thus, the weekly allowance for cleaning and oiling is $1.00 + 0.42 = 1.42$ hr. per operator. Then $1.42 \div [(40 \times 1.15) - 1.42] \times 100 - 3.19$ percent to be added to all time values. Increasing the percentage to four percent allows sufficient time to clean idle machines when necessary. This percentage has been added to all values in the tables and those in the formula expression. The time values for oiling and cleaning are selections from a separate formula on oiling and cleaning machine tools.

Re-Center Punch:

No allowance has been made for the operator to re-center punch holes to be drilled from layout. Holes should be center punched by the layout man sufficiently deep at the time of laying out the work, and not at the drill press by the operator.

Cutting Oils and Coolants:

The proper cutting oil or coolant should be used for all machining operations on all metals. A soda water mixture should be used for all drilling, and should be supplied to the drill in a constant flow. It serves the purpose of lubricating the drill and also carries off the heat caused by the cutting action of the drill. It increases the life of the tool and allows the use of greater feeds and speeds. General shop practice is not to use a coolant on cast iron. This is due to the abrasive effect of the chips when mixed with a liquid. If a coolant can be supplied in such quantity that it washes away all chips or cuttings, it should be used; otherwise the abrasive action of the chips will shorten the tool life and ultimately increase the time and costs.

Spot Drill to Layout:

When drilling to layout, it is necessary for the operator to use a smaller drill (about 9/32 in. diameter) and spot drill to a depth of approximately 1/16 in. all holes 5/8 in. diameter or over where accuracy is required.

Machining Tables — General:

The tables for drilling and tapping take into consideration the length of the lead of both drills and taps. The tables for drilling include depths to 5 in. drilled with a 3-in. or smaller drill. The tables for tapping include depths to 5 in. tapped with a 3 in.–3½ tap or smaller. If in any case a hole deeper than those specified must be drilled or tapped, do not use the tabulated values as a base, but use the drilling or tapping time per inch as specified at the bottom of the table, allowing for the lead of the drill or tap. It is necessary to read the value for each hole in the table; that is, if there are two ½-in. holes drilled in 1-in. thick material, it is not correct to take the time for drilling 2-in. with a ½-in. drill. The correct procedure is to take the value for drilling one inch and multiply by two. The tabulated values include the ten percent machining allowance plus four percent for oiling and cleaning.

(*To be continued*)

Table No. 5—Time To Drill Copper

(*Peripheral Speed — 180 Ft. Per Min.*)

Drill Size	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3
R.P.M.	1200	1200	1200	914	688	551	457	392	344	306	275	250	228
Feed	0.006	0.009	0.012	0.012	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Drill Lead	0.075	0.113	0.150	0.225	0.300	0.376	0.451	0.526	0.600	0.675	0.750	0.825	0.900
Depth	Allowed time in decimal hours (includes drill lead)												
1/8	0.0005	0.0004	0.0004	0.0006	0.0008	0.0012	0.0016	0.0021	0.0027	0.0034	0.0041	0.0049	0.0058
1/4	0.0007	0.0006	0.0005	0.0008	0.0010	0.0014	0.0020	0.0026	0.0031	0.0039	0.0047	0.0055	0.0064
3/8	0.0012	0.0009	0.0007	0.0010	0.0013	0.0017	0.0023	0.0030	0.0036	0.0044	0.0053	0.0061	0.0072
1/2	0.0016	0.0011	0.0008	0.0012	0.0015	0.0020	0.0027	0.0034	0.0041	0.0050	0.0059	0.0068	0.0079
5/8	0.0019	0.0013	0.0010	0.0014	0.0018	0.0023	0.0030	0.0038	0.0046	0.0055	0.0065	0.0074	0.0086
3/4	0.0022	0.0016	0.0012	0.0017	0.0020	0.0026	0.0034	0.0042	0.0050	0.0060	0.0071	0.0081	0.0093
7/8	0.0026	0.0018	0.0013	0.0019	0.0022	0.0029	0.0037	0.0046	0.0055	0.0065	0.0076	0.0087	0.0100
1	0.0029	0.0020	0.0015	0.0021	0.0025	0.0032	0.0041	0.0051	0.0059	0.0070	0.0082	0.0093	0.0106
1 1/8	0.0032	0.0022	0.0017	0.0023	0.0027	0.0035	0.0044	0.0055	0.0064	0.0076	0.0088	0.0100	0.0114
1 1/4	0.0034	0.0024	0.0018	0.0025	0.0029	0.0038	0.0048	0.0059	0.0068	0.0081	0.0094	0.0106	0.0120
1 3/8	0.0039	0.0027	0.0020	0.0027	0.0032	0.0040	0.0051	0.0063	0.0073	0.0086	0.0100	0.0112	0.0128
1 1/2	0.0043	0.0029	0.0022	0.0030	0.0034	0.0043	0.0055	0.0067	0.0078	0.0092	0.0105	0.0119	0.0134
1 3/4	0.0049	0.0032	0.0025	0.0034	0.0039	0.0049	0.0062	0.0075	0.0087	0.0102	0.0117	0.0132	0.0148
2	0.0056	0.0038	0.0028	0.0038	0.0044	0.0055	0.0069	0.0083	0.0096	0.0112	0.0129	0.0144	0.0162
2 1/4	0.0061	0.0042	0.0031	0.0042	0.0048	0.0061	0.0076	0.0092	0.0105	0.0123	0.0141	0.0157	0.0176
2 1/2	0.0070	0.0047	0.0035	0.0046	0.0053	0.0066	0.0083	0.0100	0.0115	0.0133	0.0153	0.0170	0.0190
2 3/4	0.0077	0.0052	0.0038	0.0051	0.0058	0.0072	0.0090	0.0108	0.0124	0.0144	0.0165	0.0183	0.0204
3	0.0083	0.0056	0.0041	0.0055	0.0063	0.0078	0.0097	0.0116	0.0133	0.0154	0.0176	0.0195	0.0218
3 1/4	0.0088	0.0060	0.0044	0.0059	0.0067	0.0083	0.0103	0.0125	0.0142	0.0165	0.0188	0.0208	0.0232
3 1/2	0.0096	0.0065	0.0048	0.0063	0.0072	0.0089	0.0110	0.0133	0.0152	0.0176	0.0200	0.0221	0.0246
3 3/4	0.0103	0.0070	0.0051	0.0068	0.0077	0.0095	0.0117	0.0141	0.0160	0.0186	0.0212	0.0234	0.0260
4	0.0110	0.0074	0.0054	0.0072	0.0082	0.0100	0.0124	0.0149	0.0170	0.0196	0.0223	0.0246	0.0275
4 1/4	0.0115	0.0078	0.0057	0.0076	0.0086	0.0106	0.0131	0.0158	0.0180	0.0207	0.0235	0.0260	0.0290
4 1/2	0.0123	0.0083	0.0061	0.0081	0.0091	0.0112	0.0138	0.0166	0.0189	0.0218	0.0246	0.0272	0.0302
4 3/4	0.0130	0.0088	0.0064	0.0085	0.0096	0.0118	0.0145	0.0174	0.0198	0.0228	0.0258	0.0284	0.0316
5	0.0137	0.0092	0.0067	0.0089	0.0100	0.0122	0.0152	0.0182	0.0208	0.0238	0.0270	0.0298	0.0330
Per Inch	0.0027	0.0018	0.0013	0.0017	0.0019	0.0023	0.0028	0.0033	0.0037	0.0042	0.0047	0.0051	0.0056

PREVENT CASUALTIES in Your Screw Driving Army

PHILLIPS SCREWS END DRIVER-SKIDS!

"Speed up, and do it safely!" That's 1943's war production challenge. This year we can't afford another sacrifice of 500 million worker days to preventable shop accidents . . . like injuries from skidding screw drivers.

Safety measure No. 1 for screw driving operations is accomplished when you specify screws with the Phillips Recessed Head. The driver *can't* slip out of the recess to slash a worker, or damage the work!

Relieved of fear, workers naturally step up speed. And, the *automatic centering of driving force* in the scientifically designed Phillips Recess eliminates many other handicaps to speed: the fumbling, wobbly starts . . . re-driving of slant-driven screws . . . removal of broken-head screws . . . reclaiming of marred parts. Fast, faultless, *safe* driving becomes automatic, even for "green hands." Power driving becomes practical.

They cost less to use! Compare the cost of driving Phillips and slotted head screws. You'll find that the price of screws is a minor item in your total fastening expense . . . that it actually costs less to have the many advantages of the Phillips Recess!

KEY TO FASTENING SPEED AND ECONOMY

The Phillips Recessed Head was scientifically engineered to afford:

Fast Starting – Driver point automatically centers in the recess . . . fits snugly. Screw and driver "become one unit." Fumbling, wobbly starts are eliminated.

Faster Driving – Spiral and power driving are made practical. Driver won't slip out of recess to injure workers or spoil material. (Average time saving is 50%.)

Easier Driving – Turning power is fully utilized by automatic centering of driver in screw head. Workers maintain speed without tiring.

Better Fastenings – Screws are set-up uniformly tight, without burring or breaking heads. A stronger, neater job results.

PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS • MACHINE SCREWS • SELF-TAPPING SCREWS • STOVE BOLTS

21 SOURCES

American Screw Co., Providence, R. I.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
The H. M. Harper Co., Chicago, Ill.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
The Charles Parker Co., Meriden, Conn.
Parker-Kalon Corp., New York, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.
Russell Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Reading Screw Co., Norristown, Pa.
Pheoll Manufacturing Co., Chicago, Ill.
Scovill Manufacturing Co., Waterville, Conn.
Shakeproof Inc., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn.
Whitney Screw Corp., Nashua, N. H.

Absenteeism a Community Problem

ABSENTEEISM, states Donald Nelson, is "eating up the heart of production." In the same breath he adds that it has other causes than lack of patriotism, two of them being a shortage of housing and of transportation.

"We propose," says Mr. Nelson, "to solve the problem of absenteeism in the community where it should be solved." He is convinced that each community must work out the problem for itself.

Reports from the West Coast confirm the soundness of Mr. Nelson's proposal. As more and more men are called into active service, jobs in war factories are being filled by older men and by women. They come from all walks of life—lawyers, housewives, mothers, people who are coming into industry more because of patriotism than because of the lure of high wages.

Shifts run round the clock seven days a week. Millions of men and women are working all hours of the day and night.

Outside of the time in the shop and at home asleep, they must have an opportunity to go to the doctor and dentist, to do necessary shopping and to relieve the tension under which they are living by means of recreation. As one of Washington's highest officials has said, "Take away everything that makes for fun and we are not sure that we can conduct a successful war."

This radical shifting around in the daily lives of people, caused by the war employment needs of our factories, then becomes the community problem that Mr. Nelson says it is. Adequate housing is one phase of the problem. Adequate transportation to and from work is another phase.

Over and above these considerations, however, is still another. It is about time that the upside-down schedules of millions of people become the basis for a readjustment of shopping and professional hours in our industrial cities.

Retail merchants, wherever they have not already done so, should get together and arrange for their stores to be open at odd hours to accommodate those who cannot shop at any other time.

It would be of great and valued service to those communities if the doctors and dentists agreed to maintain office hours until midnight two or three nights a week. That would enable patients to come to them instead of being compelled to take a day off for that purpose.

Absenteeism is one of our worst wastes of manpower. At a time when we are in a position of having to ration manpower, unnecessary absenteeism is a blot upon our war production record. The person who absents himself from his job just to take a day off is doing a disservice to his country.

But much of today's absenteeism is not of that kind. It stems from the personal needs and family responsibilities of workers outside their war factory jobs. It is a problem so large and complex that it involves the community as a whole.

If each community in which absenteeism is serious will tackle the matter as a community problem —with merchants and doctors and municipal authorities and manufacturers cooperating—we firmly believe that Mr. Nelson is right in prophesying that it can be sharply reduced.

Should that be done, millions of wasted manhours will be put back into war service.

Burnham Finney

GAGING BUSINESS

Production of war materials continues to rise steadily, influenced by the demands of the services, tool shipments and manpower. Raw materials have eased somewhat; manpower is largest headache. January tool output dropped

To Rise To Autumn Peak War production in this country's factories is still expanding. It will not hit the anticipated peak until next September or October. There will not be, however, a steady rise in manufacture of all kinds of munitions and other war goods. The volume will vary, going up in some items and down in others. The greatest push will be in airplane output, which will not reach the top monthly goal set for it until next December. Over 40 percent of the war production program, based on dollar volume, is in aircraft.

The 1943 shipbuilding schedule, which calls for a total of 20,000,000 tons of merchant ships, is being well maintained and the year's goal will be realized unless unexpected delays develop. Airplane manufacture is expanding. Whether the 1943 goal can be attained depends pretty much upon how many design changes must be made in U. S. aircraft as the year goes along. The serious problem is being licked of producing enough component parts for the most critical war programs, such as planes, ships, high-octane gas plants and synthetic rubber factories. High war officials express the private opinion that components are no longer a problem.

Raw Materials Have Eased Raw materials are causing less anxiety, though the situation continues tight. Steel is not so short as it was, except in a few items. There isn't enough copper, but the supply is better than it was a few months ago. Aluminum is worst in certain categories, such as extrusions and forgings. The shortage in these two items is critical. One factor helping to ease conditions is the amount of scrap recovered from the war fronts which is flowing back to American factories. The friction between the various service agencies in dividing up available stocks of materials is somewhat less.

Manpower Has Tightened Overshadowing all other problems at the moment is that of manpower. If the government proceeds without any important modification in its policy of raising a maximum army, doubt exists in some quarters in Washington that production goals can be reached. In the machine tool industry, to cite one pertinent example, plants are losing men rapidly to the armed services and the result may be a delay in delivering much-needed special machines for the aircraft production program. The loss of skilled men may be so great as to contribute to an involuntary reduction in the volume of machine tools made in March.

January Tool Output Down Machine tool output during January was in the neighborhood of $117,000,000, which is a drop from the December figure of $130,000,000. The decrease was not unexpected, as January often shows a falling off from December because the industry likes to crowd as large shipments as possible into the last month of the year. February is estimated to have topped the January total, though no figures are yet available. Beginning in March or April a downward trend in machine tool production is likely to set in and will continue throughout the remainder of the year.

Current backlogs of machine tools add up to about $800,000,000, or more than six months' business based on present operations. Cancellations are reported to be declining. Net bookings of machine tools orders, after making allowance for cancellations, run around $60,000,000 a month, which still is some six to seven times the prewar average. A large quantity of orders for the aircraft program is yet to be placed. Aircraft is by far the biggest source of new machine tool business. Very little replacement business has appeared to date from war factories. It is believed in reliable quarters that total machine tool production in 1943 will be in excess of $1,000,000,000.

Unused Tools Are Found A considerable supply of unused machine tools is being turned up by the current efforts of the Tools Division of the War Production Board to find idle machines in war plants which can be transferred immediately to other plants where they can be put to work. In one factory alone over 400 tools were found and were turned over to those who desperately needed them. The campaign has had two salutary effects: one, to develop a new and profitable source of tools for emergency purposes, and the other to spur on present owners of idle tools to use them so that they will not be deprived of them. At first considerable opposition to the policy came from the Army, Navy and other contractors reluctant to surrender tools that they may require at some indefinite future date, but this opposition has died down.

More attention is being turned in Washington to fulfilling the machine tool commitments made to Russia and to Britain. The Soviet government is known to be seeking tens of millions of dollars worth more for delivery in the next six months.

And Ever Upward— In January, war expenditures by the U. S. Government totaled $6,254,000,000, which was $129,000,000 or 2.1 percent higher than in December and 185 percent greater than in January, 1942. The average daily rate of expenditure in January, 1943, was $240,500,000

Transfer Order Aims to Stop Hoarding by Services

District Service officers' enthusiasm has brought hoarding of machine tools. The order could control privately-owned tools. Skilled labor is a factor in distribution

BY ROBERT COLBORN

WASHINGTON—It may seem strange that the War Production Board waited till an easier machine tool demand was in sight to issue its machine tool transfer order. (Refer to text of order, last issue). Tools have stood idle in large numbers since before the Jap attack last year, and officials privately admit the transfer program is months late. The order was Wilson's first act after he took over Eberstadt's job in WPB; perhaps the deduction is that Wilson brings a new and vigorous approach to machine tool and other problems.

On the face of it, the order might appear to be aimed solely at war manufacturers to stop their hoarding machine tools. But that is not the case. Mainly responsible for scores of idle tools in many plants were the district officers of Army and Navy.

Services Opposed Shifts

For example, a large company building airplane engines had a number of idle tools it intended to use when it got into full production. Another, non-Air Force, plant was being delayed for lack of exactly those tools. But the Air Force said No. A well-known durable goods plant, and a large auto industry plant likewise were loaded up with idle tools. A gear and machinery company was ready and waiting to use them, but Ordnance said No. These are examples of many such cases.

The manufacturers naturally didn't want to let go of their reserve tools, but probably they could have been persuaded to do so, had not they been supported by district Service officers in their natural desire to keep them. The motive of both manufacturer and Service officer, of course, was to make sure of doing the job on schedule, and let the other fellow look out for himself.

Can Affect Private Owners

This order was written primarily to cover the machine tools owned by the Defense Plant Corporation, but it carries authority over privately-owned tools also. However, the Machine Tool Division has no intention of going around looking for an idle tool here and there.

Generally speaking—very generally—the privately owned tools are not the newest, most efficient ones. Tools owned by DPC and on lease to war manufacturers are of the newest and best, many of them special-purpose tools. WPB has chiefly in mind to effect the transfer of these newer tools which can make such precision products as airplane engine gears and superchargers.

Nearly half of the war program measured in dollars, is now in the aircraft category; this proportion may be raised to more than half before the war ends. It is superchargers, not horsepower alone, that enables warplanes to perform under an even flow of power at all altitudes. For example, the new British Rolls Royce 67, which gives the Spitfire good performance up to 40,000 feet, has no more power than the American Allison, which cannot do nearly as well for the Curtiss-Wright Warhawk and the Bell Airacobra. This is not intended to overemphasize the importance of air war at high levels; most fighting is still done in the thirties, twenties, and on down to the treetops. Airplane engine production is ahead of airframes, and is being slowed a bit, but the Army wants a huge reserve of engines for the big last fight.

Demand Will Vary

How much the machine tool demand will ease off is a controversial question. No man is capable of knowing what new projects might develop as the result of a turn in the war, or as a result of invention. Replacement of worn out machines will continue; and there will be changes in the design of tanks, guns, ship and boat engines, ship and boat propulsion gear, aircraft, and other items. The same will be true of the Allies to whom we have been exporting tools.

But a still more important factor is the outlook in skilled labor. Machine tool plants, and all kinds of war plants that use machine tools, are losing their skilled men rapidly. They will continue to lose them. The Army might win its request for expansion of military manpower at the expense of war and essential civilian production plants. For lack of skilled workers, some machines, in both machine tool plants and in ordnance and aircraft plants, may have to be reduced to less hours per week. If so, the tool requirement will be increased.

ELECTED VICE PRESIDENT NMTB

CLEVELAND — Albert H. Eggers, president of Greenlee Brothers, Rockford, Illinois, has been elected first vice president of the National

ALBERT H. EGGERS

Machine Tool Builders Association. This position has been vacant for several months, since Walter Tangeman, vice president of the Cincinnati Milling Machine Co., succeeded to the Association presidency following the resignation of John Chafee, vice president of Brown & Sharpe Mfg. Co., when Mr. Chafee became deputy director of the tools division of the War Production Board.

Mr. Eggers was recently elected president of Greenlee Bros. & Co.

Truman Investigation Gets Cooperation of Producers

WASHINGTON—Aircraft plant managements are turning the Truman committee's investigations into an opportunity. They are telling the committee what their troubles are, and asking for remedies. Their main troubles are absentee workers, design changes, and shortages of component parts—mainly alloy steel and fabricated aluminum parts.

Absentee workers, in machine tool plants, aircraft, ordnance, and all war production plants, is now a top problem in Washington. But the bosses do not believe it can be solved from Washington. They believe that the plant communities will have to do it and are getting ready to turn the matter over to local authorities. City newspapers will help with publicity; stores will be kept open at night; children will be taken care of in centers for the purpose; recreation will be provided; regions will be set in competition against each other. But some sort of legislation will be asked for, giving the government power to deal with recalcitrants.

Machine Tool Panels Reduce "Into-Production" Time

Committees of trouble shooters aid war material manufacturers to get started and have expedited existing contracts

BY LAURANCE C. MESSICK

PHILADELPHIA—Ten groups of machine tool distributors have been helping to get Army Ordnance Department's tomorrow requirements produced today. Contracts made in January, for initial delivery July 1, will be fulfilled early in April. Contractors, who had contemplated a six-months' wait for delivery of machine tools, go into production in a fifth of that time, using substitute methods.

Contrariwise, other producers with a comfortable margin of excess producing capacity are being stripped of surplus equipment, while experts assigned to their plants show them how to make better use of fewer machines.

Such, in a small way, is the work of the Machine Tool Panels organized for Major General Levin H. Campbell, Jr., Chief of Ordnance, U. S. Army, by N. P. Lloyd, president of Lloyd and Arms, machine tool distributors. Mr. Lloyd suggested to General Campbell the setting-up of committees of machine tool dealers in each of the 13 ordnance districts. Within 48 hours after he received the "go ahead" sign, the first panel was meeting in Chicago.

The Chicago group has served as an experiment station, proving ground and school for nine other groups. At two later meetings, the Chicago panel met with the newly-gathered members of the Cleveland, Cincinnati, Detroit and St. Louis panels, and of the New York, Philadelphia, Boston, Springfield and Rochester panels. At each meeting, the Chicago members recounted their experiences, told of the results attained and generally "sold" the idea.

Headed by Steering Committee

Each panel has a "steering committee" of three members, consisting of the chairman appointed by Mr. Lloyd, and two members nominated by the chairman and approved by Mr. Lloyd. The steering committee selects the remaining members of the panel. As Supervisor of Panel Activities, Mr. Lloyd reports to General Campbell.

Panel members are paid neither salary nor expenses, though they often are asked to travel and to spend much time away from their businesses.

Each steering committee meets weekly at a stated time, in the office of the Ordnance District to which it is attached. At the meeting is present an army officer, appointed to act as liaison between the steering committee and Ordnance's four production branches: tank and combat vehicles; artillery branch; small arms; and ammunition, which handle the administration of contracts in the districts. When one of these branches encounters a production or delivery problem, it is taken up with the liaison officer of the district, who then presents it to the steering committee.

The plan lessens the likelihood of conflict between the civilian and military, for the liaison officer, or the officers of the four local branches, work in collaboration with the civilian panel. When there is military credit to be gained, the military officers get it. When there is civilian pressure or censure to be applied, the civilian panel members apply it. When military pressure must be brought, through channels, the military officers handle it.

Panels are concerned with preparation for and commencement of production and with improvement of already-rolling production lines. When the panels were first formed, many contractors were far behind schedule. To get these producers swinging, a panel member worked with each of them.

When a contract is awarded to a producer within their Ordnance District, the panel members meet with him and thresh out the problems attendant upon getting into production. Panel members help him devise methods and procedures to lick his production problems. They use their personal knowledge and pressure to obtain machines for him. They set him right in questions attendant upon getting the most out of each available machine and of substituting other machines to "make 'em do" until new ones are obtainable.

RE-PRICE USED MACHINE

WASHINGTON—Price ceilings on used machine tools will soon be cut 2 to 60 percent through the operation of a table of equivalent values being drawn up by the Office of Price Administrations. In addition to reducing the price to the user, the OPA is seeking to stimulate rebuilding by widening the margin between "as is" and rebuilt prices. Prices of some used machinery now exceed cost when new, due partly to lack of a definite basis for determining which recent models to use for comparison. Under the new system machinery no longer being made will be tied up with specific late models. Where no similar model exists, OPA will set a base for computing prices.

Substitutes Proved Effective

In many instances, substitute machines have been found to be as good as, or even better than, the machine originally scheduled for such work. The substitution of machine tools has been an important factor in expediting the beginnings of production. Inter-plant loaning of critical equipment has been another device to rush production.

One of the many advantages in the operations of the machine tool panels is the spread of the work among small plants by means of subcontracting. It is felt that the work of the panels has resulted in a wide distribution of Ordnance work among small plants.

To systematize the procedure of tooling up, a machine progress report is set up, with an arbitrary line marked for time of getting into production. The machines needed are listed, and opposite each is indicated, under the proper date, the time such a machine may be expected to be delivered, if it must be procured. Colored tacks, with a string stretched between, trace a zig-zag line transcending the arbitrary bogey line. The peaks extending farthest past the bogey line are then attacked by the panel. Efforts are made to secure a machine from a producer who can be shown how he can spare it, or to show the contractor with whom they are working how he can use a machine he already has or which is more readily available.

Sought Surplus Machines

To get a new contractor into production, panel members have gone into other factories, there devised means of sparing machines more urgently needed for the new production line, and talked owners into releasing them. By doubling back a production line, some machines handle two operations.

"Accelerating the time of production" is the keynote of the panels' efforts. This is applied not only to the problems of getting production under way, but also to matters attendant upon speeding production already going on.

To gain release of machines from factories where they're not being fully utilized, panel members often find themselves faced with the task of prying equipment away from customers to whom they but recently sold it. In other instances, they will recommend the cancellation of contracts they but recently executed, but under which machines have not yet been delivered.

The panels and their allied committees have reallocated small tools in the same way. Similarly, they have found sources to make repairs or to build fixtures for existing tools.

Without fanfare or alphabetical designation, gold braid or red tape, the Machine Tool Panels have fought the problems of starting the wheels of wartime production.

INSIDE DETROIT

BY SILER FREEMAN

New orders for Detroit war plants will largely be subcontracted to areas where labor is not critical. Truman investigation of Willow Run started with antagonism, ended with praise. Transportation and housing were blamed

Through, not at Detroit Detroit war plants are due for important new war contracts, but the majority of the work will not be done in plants here. Because of the growing manpower problem in this critical area, so designated by the War Manpower Commission, the Army is insisting that much of the new orders be subcontracted to non-critical areas.

Under this plan, the Ford Motor Company has been given a contract calling for doubling output of Pratt and Whitney aircraft engines at its River Rouge plant. Willow Run, which has had its schedule tilted by the Army Air Force, may also be called upon to do work now being done there.

Will Replace Tank Engines Highland Park and the Lincoln plants, where tanks and tank engines are being turned out, are expected to get part of the Pratt and Whitney contract. Their items are being cut back by new demands of war and the aircraft engine work will take up the slack there.

But most of it will go outside of Michigan, to Ford branches located in non-critical areas such as the plant in Minnesota. Some of his "village industries," mostly placed in sections not pressed for labor, will also come into the production picture on the P & W.

Other Plants To Be Affected Ford will not be the only one affected, according to Col. George E. Strong of the Central Procurement District offices. Murray, Briggs and Chrysler are also being called upon to accept new contracts on the condition they will not keep them in this area.

"We want balanced production and balanced manpower," said Colonel Strong. "All plants expect to reach maximum production at about the same time. They cannot do this with the available manpower in this area.

"So far, each company has been looking at its manpower problem solely from its own angle. But now we must get the entire picture. That is what is causing us concern. While the labor pinch has only been felt by a few, it is getting worse daily."

Better Use of Labor a "Must" "We are calling on the companies to make the best possible use of manpower. We must get more women into the factories and we must use all the available material, Negroes and minority groups who have been sidestepped so far."

Packard, whose augmented program was announced some time ago, has already agreed to subcontract a good part of its new program. General Motors will not be greatly affected here, most of its plants being outside of the Detroit area.

Colonel Strong announced that the government policy would be to place all the contracts available here, providing there would be no drain on manpower. That is the understanding with Ford. It won't up manpower need, he said.

Ford Dodged Subcontracting The subcontracting idea is not a new one but one which Ford has long been loathe to accept. The company likes to keep its work right in its own plants, being proud of its self-sufficiency. It has been a target of criticism on this ground. That is one of the charges leveled against Willow Run's slowness in getting into production. Pressure from the Army has caused a shift in this policy.

The $45,000,000 aircraft engine plant at Ford will get greater utilization under the new program. Only one assembly line is now in operation. The entire first floor will be turned over to assembly.

Manpower Is Big Problem Manpower is accepted as the most pressing problem in the Battle of Production here, as exemplified by the foregoing. This is especially true at Willow Run, as even the Senate Truman committee will now admit after a day's visit there.

Led by Senator Harry S. Truman, who left Washington with the assertion that something must be wrong at Willow Run and the government was greatly disappointed with its production so far, the group came into Detroit

More Power to Them!—With factories already producing at an unprecedented rate, new Army schedules call for tripling Buick production of Pratt & Whitney bomber engines in 1943. A scene in Buick engine assembly plant shows new bomber engines just off the line being prepared for initial run in test cells. From assembly line into test cells in an average of 20 minutes is the proud performance of these war workers

The Eyes Have it—Keen sight is a "must" for women whose job it is to detect any possible defect in shell fuze parts, at the Stewart-Warner Corp. plant. By means of powerful magnifying glasses, inset, they are able to pass on thousands of parts and to find defects invisible to the naked eye

looking for trouble. But it left quite chastened with the statement that lack of adequate transportation was complicating the manpower problem at the bomber plant and giving it a fair bill of health in saying:

"The plant compares well in production with any aircraft plant we have seen and we have seen most of them."

Senator Made Little Headway It left Senator Homer Ferguson, Detroit's own ace prober, to try to straighten out the transportation problem by inducing the railroads to run shuttle service to Willow Run. Senator Ferguson left Detroit without making much headway but promising that something would be done.

The senators were met here by more than the Willow Run problem. The day before they arrived, 1,000 at River Rouge were laid off because of lack of a certain part which was supposed to come from Cleveland. A union committee, headed by R. J. Thomas, UAW-CIO chief, interrupted the Truman committee's breakfast at the Hotel Statler to give it some facts on plants which they charged were not properly utilized.

But after listening to the union officials in chambers, Senator Mon Wallgren announced that housing and manpower and transportation were the principal charges left with them.

Labor Turnover Has Been High The extent to which manpower is plaguing the Willow Run production was shown by figures given out previously by Ford officials. It showed that although the plant had reached employment figures of about 35,000 by the middle of February, it had had a turnover of 10,149 employees since June 16, 1942, an average of about 1,268 a month over the eight-month period.

In February, the turnover reached the startling proportions of 63 percent. In the first 16 days of February, the plant lost 750 workers. The Army was found to be the biggest competitor for male workers. It lost 403 to the services, 327 by draft and 69 by enlistment. Seven joined the WAACs.

Hiring has been a problem. The quits almost balance the new employees. Many will not travel to Willow Run to be hired. To offset this, Ford has set up employment offices in Detroit.

Morale is said to be low there, although Ford officials deny it. Many new workers resent methods used by the supervisory force. Others call it "gestapo" methods and quit.

A Panacea: Solve Transit But on its quick tour of the huge bomber plant, which took the Truman committee not more than 45 minutes by trackless trolley, the senators decided that if transportation were solved, the whole Willow Run enigma would be solved. Many believe they are sanguine in this conclusion.

But the Truman committee left a door open. It is going to meet again and discuss new evidence, new reports and new angles.

"We have no axes to grind, no conclusions to prove," said Senator Truman.

Emergency Steels Okay for Critical Parts Says NMTBA

CLEVELAND — National Emergency steels now available are satisfactory for the manufacture of critical machine parts, says the Committee on Strategic Materials, of the National Machine Tool Builders Association. Over 100 gears, made from known materials and NE 9442 and NE 9445, were tested so that the results would be of value in selection of national emergency steels for other critical machine parts.

A. L. Hartley, a member of the committee and metallurgist for the R. K. Le Blond Machine Tool Company, built a testing machine on which gears can be run under a wide range of loads, and subjected to shocks similar to those resulting from an interrupted cut on a machine.

It was found that the presence of inclusions in the steel had a greater effect than the type of heat-treatment, or the use of forged versus cut blanks. This circumstance suggests the importance of close metallurgical control of the steel as received.

Flame hardening was employed for some gears; furnace hardening for others. When there was deep penetration of hardness, the two methods gave practically identical results. Drain structure was examined at the tip, pitch line, base of tooth, and below the base in the hub of the gear.

According to the tabulated results for horsepower transmitted, the committee feels that there is not enough difference between NE 9442 and NE 9445 to warrant the purchase of the former. However, in buying NE 9445, a lamellar pearlitic structure should be specified, even though a small extra must be paid, because of the time saved in machining. Thus, the committee again recommends the use of a limited

Horsepower Transmitted Per ⅛ In. Width of Tooth Face

Material	Hp. Range	Rockwell C
SAE 1050	3.8–4.5	53–55
SAE C1141 .... (old X1340)	3.2–4.4	49–52
SAE 4140	3.75–5.5	51–52
NE 9442	3.9–5.2	49–52
NE 9445	4–4.9	50–54

selection of NE steels so that mills and warehouses can more easily furnish a complete range of shapes and sizes in each analysis. The list is:

NE 9415—For carburizing, in thin sections and small parts. If higher core hardness is desired, NE 9420 may be used.

NE 9430—For straight heat-treating of studs, bolts or other small parts for high stresses.

NE 9445—For oil hardening small or medium size parts, or water hardening large pieces or heavy sections.

In all of these analyses, a 6 to 8 grain size (McQuaid-Ehn) is recommended.

WARTIME WASHINGTON

BY BLAINE STUBBLEFIELD

As production tempo increases, so does need of channeling to specific needs. Cancellation clause is being fashioned. Eberstadt's ouster will bring drastic CMP overhaul. Congress is gunning for the Selective Service Act

Production to Fit Demands September and October should see the peak of overall war production. After that, the rate of production will be determined not, as at present, by technical feasability, but by the actual needs of the fighting fronts. Now, we can use about all we can build because we are still filling up the transport pipelines. By September, not only will production be at peak, but the pipes will be full and we'll need to build only what the fighting fronts call for. The September-October date is actually a mere average. Each industry will meet its peak at a different time. Machine tools, for instance, have already reached theirs. Aircraft may not reach theirs until late this year or early next.

Cancellation Clause Coming You can expect within a few weeks an announcement of a uniform cancellation clause to be inserted in all war contracts, specifying the financial obligations of the contractor and the government. Practically all contracts now have some sort of cancellation clause, but they vary greatly and are not entirely satisfactory. Army, Navy and Maritime Commission are now working on a uniform clause. Part of the inspiration for their effort is that, with the end of the war beginning to appear, contractors are worried.

Perhaps more important, the cancellation clause has immediate effects on the crucial business of scheduling production of components and raw materials—a job which necessarily has to be done mostly by prime contractors. One big obstacle to such scheduling has been failure of the armed forces to place contracts that run far enough into the future. This is being corrected to some extent but even when a contractor has a long term contract, he hesitates to make commitments to his suppliers too far ahead. Most cancellation clauses now provide that the contractor will be paid for obligations "reasonably" assumed, but few contractors relish the prospect of proving reasonableness to a court. Nevertheless, when an engine contractor, say, expects to deliver an engine in twelve months, someone down the line ought to take delivery today on an aluminum ingot.

Struggle Came to Surface The long-brewing intra-WPB struggle between vice-chairmen Charles Wilson and Ferdinand Eberstadt burst into a crisis last month. Eberstadt was fired and Wilson took full responsibility, under Donald Nelson, for WPB operations. Vice chairman William Batt will, under Wilson, take on responsibility for the mechanics of Eberstadt's former post.

To industry, the immediately important aspect of Ferdinand Eberstad's ouster is its impact on the Controlled Materials Plan. CMP will not be thrown out the window. But it unquestionably will come up for a drastic overhauling. Charles Wilson, the new boss, doubts that the plan in its present form can be made to work.

As to CMP, Wilson is on a tough spot. He sees as clearly as anyone that it has gone too far to be scrapped. CMP's removal would create infinately more confusion than its existence, would leave industry with no comprehensive material control system. To prevent chaos, Wilson has to make a plan work which he doesn't really believe can work.

Will Cushion Transition In this situation, you should expect moves to ease, and probably slow the transition from PRP to CMP. Many firms are not yet under the plan. Many more are nominally under but actually unprepared to deal with it. Such firms will either be provided with some short-cut to get the benefits of an allotment number or will have their PRP allocations strengthened.

May Delete Standard Goods Under consideration is a more drastic step—removal of the Class B products from CMP treatment altogether. These are the standard goods—commercial items and components entering into a variety of military goods. It is these items that have caused the bulk of the confusion in applying CMP. Plan is to put manufacturer of such goods back under PRP or something close to it—a step for which many of the manufacturers have been pleading. Then the vertical manufacturer-to-supplier-to-subsupplier control which is admittedly needed even in Class B goods would be provided by insistence on tight production scheduling. But the scheduling would be done alongside of, rather than as an integral part of, the material-control system.

The Class A products—special-design military goods—will undoubtedly continue for some time to come under substantially the present CMP rules.

Transition Had Commenced Even before Eberstadt was fired an important but little noticed step had been taken to smooth the transition from PRP to CMP. WPB has started assigning allotment numbers out of hand to every class B producer who submits a CMP-4B application form. The allotment covers 30 percent of what he asks for, will be supplemented later when his application receives formal processing. This has two effects: it safeguards industry against WPB delay in issuing allotments; and it makes it easy for firms who missed the February 9 deadline on CMP-4Bs to get under CMP anyway.

Open Season on S.S.A. Congress is now busily engaged in hacking away the WMC's strongest present source of authority—the Selective Service Act. The Kilday Bill, overwhelmingly approved by the House Military Affairs Committee last week, is deliberately designed to knock out any use of the draft to enforce the work-or-fight policy which is WMC's only method of compulsion over individuals.

Actually, Congress itself is wiggling on the horns of a dilemma. It's trying to satisfy two contradictory public desires. On the one hand, the public deeply resents the regimentation involved in the work-or-fight policy. Congressmen have been flooded with letters protesting WMC's order of last month creating "non-deferable occupations" from which men are to be drafted regardless of dependency. At the same time the farmers are feeling, and protesting about, the first impact of a labor shortage. Main job of any tough manpower policy would be to force men into the dirty low-paid jobs on the farms and in the mines. Manpower Commissioner McNutt is the unlucky man in the middle. He may lose his job.

The Kilday Bill expresses the first reaction. It does not aim greatly to change draft procedure, neither forbidding occupational deferments nor insisting on an impossible uniformity among draft boards. Touted as keeping fathers out of the army, the bill actually would delay by a few months the induction of fathers in non-essential occupations and speed their induction in essential occupations.

Meanwhile, the farm bloc is insisting on extension of the farm-or-fight policy. The Bankhead Bill would flatly exempt all farmers but draft them immediately if they left the farm.

Canadian Mineral and Materiel Production Gain Proportions of Importance to Allies

OTTAWA—Canadian war production will be free from import requirements of tungsten and molybdenum by July if current production prospects are realized. So far Canada has had to import all supplies of these strategic metals. New plants for production of tungsten at Salmo, B. C. and molybdenum near Quebec City will come into operation in about six weeks. When capacity is reached there may be an export surplus for the U. S.

Strategic Metal Sources

British Columbia's tungsten output will relieve Canada-U. S. shortages from South America. The Salmo bed has been established as one of the most important on the continent. Dome Mines Limited will substantially supplement joint war plant needs for molybdenum now mainly supplied from the big Climax mines in the United States. Supplementary supplies of tungsten will come from gold mines in Ontario and Quebec and to some extent from British Columbia properties as a result of a by-product reclamation program developed through cooperation between the Bureau of Statistics at Ottawa and mining companies across the country.

Canada will also become a considerable source of mercury and chromium for the war plants of the two countries during the next few months.

Recognition of Canadian capacity for the production of these strategic minerals has resulted in a loosening of manpower restrictions on the Dominion's mining industry. While many marginal properties have had to suspend or curtail operations through labor shortage those with significant prospects in needed ores are being given increased preference.

Production Rises Sharply

Munitions production in Canada will reach a value of $3,700,000,000 in 1943. This compares with $2,600,000,000 last year and $1,200,000,000 in 1941. Canada has already delivered $3,000,000,000 in war supplies out of orders amounting to more than $6,500,000,000. In World War I Canada's contribution in munitions was only $1,002,000,000.

Of current output 30 percent has been in reserve so far for Canadian fighting forces, 50 percent for Britain and Russia, 20 percent assigned to the United States and Pacific areas.

The value of aircraft production for the next 18 months is placed at $1,000,000,000. Production is concentrated on Fairchild Cornell, North American Harvard and Canadian Anson trainers; Bristol Bolingbroke reconnaissance bombers, Catalina reconnaissance amphibians, Lancaster long-range bombers, Curtiss navy dive bombers, Mosquito bombers and Noorduyn transports.

One Shift Betters Two Months

Capacity is now being reached in small arms and ammunition production. One work shift now turns out more small arms ammunition than could have been produced in Canadian plants over a two-months period when the war started. Rate of output is placed at 60 rounds a second with a value of $1,000,000 a week. Of 1,050,000 Canadian munition workers 30,000 are employed in government arsenals or plants operated by private enterprise for the government.

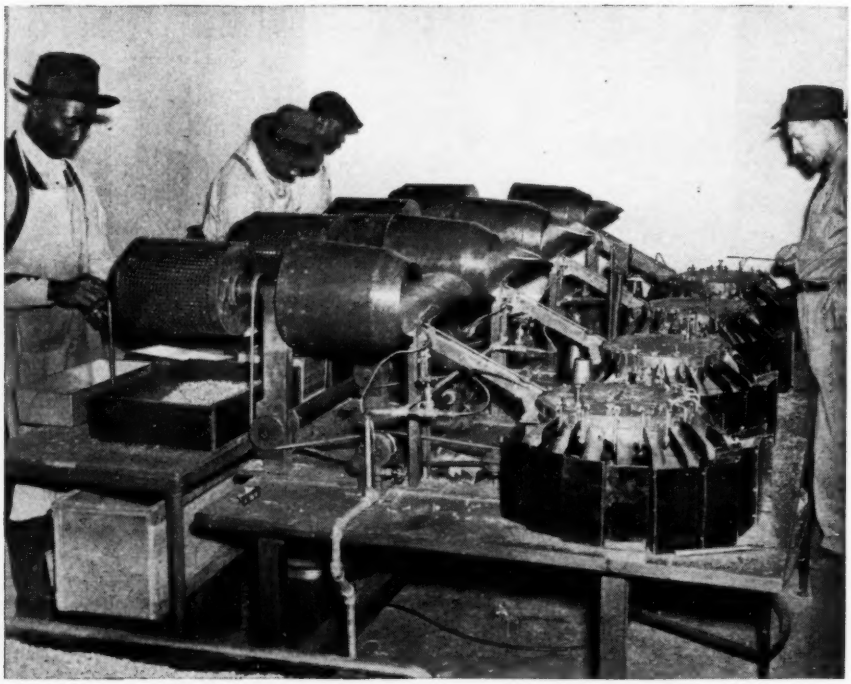
Latest roundup of production results shows an output of 400,000 automotive vehicles since the start of the war, of which 215,000 left assembly lines last year. Production experts figure 1942 production to be equivalent in material and labor consumption to 430,000 commercial trucks of which Canada's prewar average was 40,000 a year.

Shipbuilding Leads

Of contracts amounting to $3,008,000,000 awarded by Minister C. D. Howe's Munitions and Supply Department to the end of last year the largest item was for shipbuilding, $548,340,000, aircraft coming next at $477,500,000, ordnance $339,000,000, automotive transports $304,000,000. Shipbuilding contracts for the present quarter amount to over $1,000,000,000 being distributed among 79 large and small shipyards as against 28 yards in operation two years ago.

By about March 1 Canadian war plants will be required to fill in new information forms covering third quarter requirements under the Controlled Materials Plan. Supplies of U. S. materials were assured by WPB on preliminary forms accepted by Washington and Ottawa priority officials are now satisfied that allocations difficulties have been ironed out. Materials for the present quarter have been coming through under PRP.

The Ontario Provincial Government's proposal for compulsory collective bargaining legislation which would outlaw plant and other independent unions, give CIO and AFL bargaining control over all plants in Canada's main industrial area, impose the closed shop and the check-off, is under heavy fire in the Legislature at Toronto and appears likely to be modified or sidetracked until next year. Industrial organizations and independent unions are making common cause against the measure and so far have succeeded in compelling the Provincial Government to refer the question to a committee instead of introducing a ministerial bill.



Rivet Sorter and Saver—Operating two shifts, machines developed by Fisher Body Division of General Motors daily sort and save 200 pounds of vital aluminum rivets. The revolving cylinders at the far left sort the rivets according to thickness. Then they are placed in the hoppers at the center of the machine, from which they slide individually down to the rotating disk-like selector at the right. This selector first sorts them according to head type, then separates them by length

THE AIRCRAFT HORIZON

WPB is stressing reduction of design changes to expedite plane production. Durable planes are its ideal. The carrier-based Corsair promises land-plane performance.

The War Production Board regards design changes as the main problem in the way of completing the airplane program of 1943, which is about 104,000. Even allowing for the probable maximum of changes, the industry will come so near to making its goal that failure won't make much difference to the enemy. Changes in design include not only those on existing models, but shifts to new models.

The industry has the problem of making the changes, but the Army and Navy air arms have a hard job that comes before that, they have to decide which requested changes to order and which to reject. Many of them are pure whimsy, some are the product of gadget-conscious minds, some are obvious improvements and some are marginal. Service engineers have to strike a balance between the changes they would like to have, and those that can be made without slowing down production too much.

The board and the services have a formula for the ideal in quality of airplanes. The ideal is a plane whose durability and facility for maintenance are such that it can stay in the air a maximum of hours, and destroy a maximum of enemy property. Airplanes grounded for maintenance or because of their inability to cope with weather are like no airplanes at all. Quality has to be compromised against numerical output.

The newest plans of the War Command call for a production rate of 12,000 planes per month by December of this year. Presumably that would be near our maximum capacity—if we continued producing other weapons at the planned rate. Thus, in 1944 we could turn out about 150,000 planes. Considering the new and far more effective types that will be in production by that time, it is a question still to be decided whether the air forces will need or could use that many.

Everybody is watching Vought-Sikorsky's Navy shipboard fighter, F4U-2 Corsair, which went into combat against the Japs a few days ago. Admiral Chester W. Nimitz, commander in chief of the Pacific Fleet, said its performance was satisfactory, but the real trial will come with continued combat.

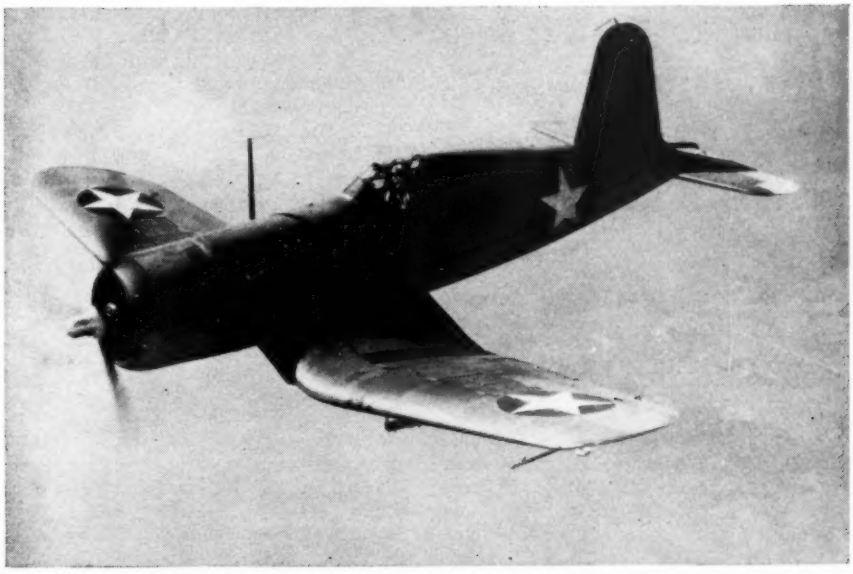
The Corsair's debut is important for several reasons. It is the only 2,000 horsepower air-cooled single-engined fighter plane in the war. (If the Army's 2000 h.p. P-47 Thunderbolt is fighting, it has not been made known.) The air-cooled engine's frontal area far exceeds that of the liquid-cooled type, but it has been streamlined in an effort to cut its drag to somewhere near that of the Allison or Rolls Royce. It is designed for operation off of carriers, and this, traditionally, would make it incapable of performance equal to that of land planes. The Corsair may upset this rule. This is a big fighter, somewhere near 10,000 pounds, and with all of that weight, it probably can outclimb the Japs. In everything else: armor, fire power, speed, altitude, range, radio and safety devices, it also leaves the Japs clear out of the race. The Army Air Force figures that the pilot represents 90 percent of its investment in striking power, the airplane, ten percent. That is why AAF builds planes to bring them back if possible. The gull wing design serves two main purposes: it beefs up the plane for the rough handling it gets, and it raises the ship high up from the deck, without an excessively high landing gear, to accommodate the large propeller disc necessary to absorb the 2,000 plus horsepower.

Goodyear was lucky to find itself announcing production of the Corsair just as the Navy announced the plane went into action. Goodyear had been building outboard wings for Corsair, meanwhile tooling up for production of the complete plane, and keeping so quiet about it that only a few insiders knew what was coming.

EDMUND T. ALLEN

A serious loss was sustained by the aircraft industry last fortnight when Edmund T. Allen, able engineer-test pilot, was killed in the crash of a Boeing "Fortress" bomber. It was not known whether Allen was at the controls when the B-17 plowed into a Seattle factory building, causing a fire and several deaths, including all of the crew of ten.

Mr. Allen, who was well known to the writer of this aviation page, was largely responsible for the development work that made possible the conquest of the stratosphere. At the time of his death he was Director of Flight and Aerodynamics at Boeing, and was in charge of a group of engineers and pilots who had spent more hours in altitude research, above 30,000 feet, than any other such group in the world.



Carrier Based, Land Performing—Vought-Sikorsky's F4U-2, the Corsair, has shown itself to be one of the hottest performers over any nation's sky

More Material Producers Honored with "E" Awards

WASHINGTON—As industry gets more thoroughly into the production of war material, each day sees the development of greater efficiency and increased production. This has resulted in an ever-spreading flight of "E" burgees from the flag staffs of factories throughout the United States. As this flight increases and spreads, so increases the production of materials for our armed forces.

Army-Navy Production Awards

Adams & Westlake Co., Advance Plating Co., Aetna Ball Bearing Mfg. Co., Aircraft Fitting Co., American Chain & Cable Co., American Ship Building Co., American Cyanamid Co., Anderson Brass Wks., Inc. (shell plant), Anthony Co., Inc., Arter Grinding Machine Co., Associated Spring Corp. (Barnes-Gibson-Raymond Div.), Atlantic Products Corp., Atlas Imperial Diesel Engine Co., Babcock & Wilcox Co. (Refractories Div.), Bethlehem Steel Co., Black & Decker Mfg. Co., Borg-Warner Corp. (Long Mfg. Div.), Pump Engineering Service Div.), Boston Gear Wks., Brewster Co., Brown Shipbuilding Co., Buffalo Pumps, Inc., Butler Mfg. Co., Chicago Pneumatic Tool Co., Clark Equipment Co. (Truck-tractor Div.), Cleveland Automatic Machine Co., Columbian Steel Tank Co., Continental Roll and Steel Foundry Co. (Duquesne Div. plant), Continental Rubber Wks., Corning Glass Wks., Crane Co. (Chicago Wks.), Cummins Engine Co.

Detroit Broach Co., Eclipse Counterbore Co., Fairbanks, Morse & Co. (Beloit, Freeport, Three Rivers plants), Fairchild Engine and Airplane Corp. (Airplane Div.), A. B. Farquhar Co., Fidelity Machine Co., Fleetwings, Inc. (Plant 1), Ford Motor Co. (Aircraft Engine Div.), Formica Insulation Co., Fulton Sylphon Co., General Electric Co. (Pittsfield plant), General Electric X-Ray Corp., General Motors Corp. (Inland Mfg. Div., Moraine Products Div., Rochester Products Div.), Goddard & Goddard Co., George Gorton Machine Co., Granite City Steel Co., Gray Marine Motor Co. (Diesel Engine, Gasoline Engine plants and Shipping Div.).

Harrington & Richardson Arms Co., Guy F. Harvey & Son, Hoover Co., Horton Mfg. Co., Illinois Gear and Machine Co., Illinois Tool Wks., Inland Steel Co., International Harvester Co. St. Paul Wks., International Register Co., C. O. Jelliff Mfg. Corp., Kelsey-Hayes Wheel Co. (Jackson, McGraw, Military plants), Keokuk Electro-Metals Co., Koppers Co. (American Hammered Piston Ring Div.), Marine Iron and Shipbuilding Co., Maryland Drydock Co., Michigan Seamless Tube Co., Midwest Mfg. Co., Charles Mundt & Sons, National Carbon Co. (Krene Div.), National Machine Products Co., National Munitions Corp.

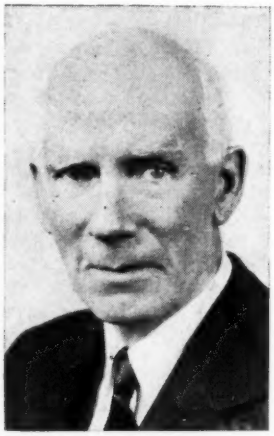
NAMES in the NEWS

Albert H. Eggers, vice president and machine tool sales manager of Greenlee Bros. & Co., Rockford, Ill., has been named president to succeed George C. Purdy, who has become chairman of the board. Mr. Eggers joined the organization in 1915 when it began manufacturing metal-working machinery. Leslie H. Geddes, assistant sales manager in charge of screw machine sales, has been appointed second vice president. O. Vincent Haegg has been named to succeed Albert E. Alverson as secretary of the company, and Mr. Alverson has retired after 42 years of service with Greenlee.

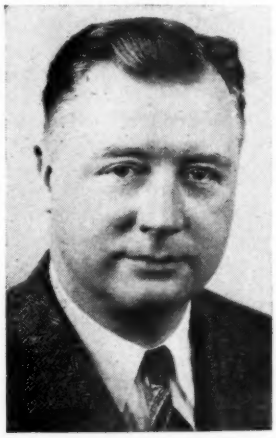
Edna G. Swift, widow of the late Charles C. Swift, for several years president and general manager of Ohio Machine Tool Co., Kenton, Ohio, has been named to succeed Mr. Swift as president and treasurer. Cecil J. Davis, production engineer, was elected executive vice president.

Eric L. Bergland, director of procurement and service department, and Walter U. Reisinger, secretary and treasurer, Remington Arms Co., Bridgeport, Conn., have been named vice presidents. Mr. Bergland began his business career with the du Pont interests in 1904 in the engineering department, in 1941, he was made president while continuing to act as executive vice president of the Geo. D. Roper Corp.

Greenlee Bros. Makes Executive Personnel Changes



GEORGE C. PURDY



LESLIE H. GEDDES

Sidney A. Stewart, general manager of Hamilton Standard Propeller Div., United Aircraft Corp., East Hartford, Conn., has been elected a vice president. He will continue as general manager of the Propeller Div. Charles J. McCarthy, general manager of Vought-Sikorsky Div., United Aircraft Corp. at Stratford, Conn., has been named vice president of United Aircraft Corp. J. Reed Miller becomes general manager of Vought-Sikorsky Div. at Stratford, while Joseph M. Barr has been made assistant general manager. Rex B. Beisel has been appointed acting general manager of Chance Vought Aircraft Div. and will also continue in his capacity as engineering manager.

S. H. Hobson has been appointed president and a member of the board of directors of Geo. D. Roper Corp., Rockford, Ill., to succeed Mabon P. Roper who died recently. Mr. Hobson has been associated with the firm for 28 years, having started as assistant foreman and progressing to chief engineer in 1919. When the Roper-owned Blackhawk Engineering Co. was formed and in 1921 joined General Motors Corp. From 1931 to 1937 he was president of American Pneumatic Service Co., and has been associated with Remington Arms since 1941. Mr. Reisinger has been secretary and treasurer since 1933 and was previously connected with the du Pont organization and U. S. Army Ordnance.

Arthur Hjortsberg, who has been assistant division superintendent of Carnegie-Illinois Steel Corporation's central mills since 1940, has been appointed division superintendent.

L. G. Bean has been advanced to vice president in charge of engineering and sales of the Bristol Co., Waterbury, Conn. from the position of vice president and general sales manager, which he had held since 1939. Mr. Bean has been associated with the organization since 1920, and was district manager of the Boston and Chicago district offices prior to becoming assistant chief engineer in 1930. Harry E. Beane, who has been connected with the company since 1920, has been named sales manager

for the company and E. L. Stilson has been advanced to assistant sales manager.

B. H. Quackenbush has been promoted to assistant sales manager of Foote Bros. Gear & Machine Corp., Chicago. Formerly Mr. Quackenbush was in charge of the contract division, and in his new position he will continue to handle contract sales and in addition will supervise the activities of the priority department and the sales department under the OPA on price regulations.

Joseph D. Stites has been named manager of the Wickwire Spencer Aviation Corp. which is a new subsidiary of Wickwire Spencer Steel Co., and will spend most of his time at the Virginia and Illinois plants. Mr. Stites has been with the parent company for several years in an engineering capacity. Previously he was connected with the Mack Truck Co. as assistant engineer assigned to developing what became one of the first gas and electric rail cars. Later he joined the Ford Motor Co. as a production engineer.

Charles E. Robinson has been made general sales manager of the Sommerfeld Machine Co., Braddock, Pa. In addition to his new duties he will continue as assistant to the president.

John E. Ferguson, works manager of the fabricating division of Bridgeport Brass Co., Bridgeport, Conn., since 1931, was elected vice president at a recent meeting of the board of directors. Before joining the company Mr. Ferguson was vice president in charge of manufacture of the Ceco Co., Providence, R. I., and was associated with Westinghouse Electric & Mfg. Co. and International Arms & Fuse Co.

J. A. Ireland has been promoted to assistant general manager of sales of the Steel and Tubes Div. of Republic Steel Corp., Cleveland. He previously held the position of division sales manager.

W. I. Gladfelter has been named vice president in charge of operations of Crown Can Co., Philadelphia. Since last year Mr. Gladfelter has been general manager of production and engineering. F. Howard Braithwaite has been chosen vice president in charge of sales of the company, having previously held the position of vice president in charge of general line sales.

Benjamin F. Harris has resigned as president of National Tube Co., Oil Well Supply Co. and Tubular Alloy Steel Corp., subsidiaries of United States Steel Corp., Pittsburgh, but will remain with the corporation as a consultant to the president in connection with war activities.

Roger E. Gay, vice president of Bristol Brass Corp., Bristol, Conn., has been advanced to president of the organization to succeed Albert D. Wilson, who has become chairman of the board.

Earl L. Young, vice president in charge of production of Laminated Shim Co., Glenbrook, Conn., has announced his retirement after an association of 22 years with the company.

Otto W. Winter has accepted a position as president and works manager of Sav-Way Industries, Detroit, and has resigned as vice president in charge of manufacturing of the Republic Drill & Tool Co., Chicago. Prior to this latter connection Mr. Winter was factory manager of Columbus McKinnon Chain-Chisholm Moore Hoist Corp.; consulting engineer of Kent-Owens Machine Co.; general manager of the cutter and special tool division of Whitman Barnes, Inc.; sales engineer for Cincinnati Milling Machine and Cincinnati Grinders, Incorporated, and the Heald Machine Co.

F. Richardz has been appointed manager of the gearing engineering department of Westinghouse Electric & Mfg. Co., Nuttall Works, with which he has been connected since 1931.

Ralph R. Kimes has been appointed general manager of Aircraft Tools, Inc., Los Angeles. He was formerly connected with Douglas Aircraft Co. as purchasing agent for the three West Coast plants.

A. E. Hanbury, who was superintendent of the washing machine division of Landers, Frary & Clark, of New Britain, Conn. until his retirement in 1936, has returned to the company as general superintendent for the duration of the war.

Ernest N. Taylor has been named acting manager of the western region for Detroit Rex Products Co. with headquarters in the Chicago office of the company.

President of Roper

S. H. HOBSON

Sav-Way President

OTTO W. WINTER

Sommerfeld Sales Head

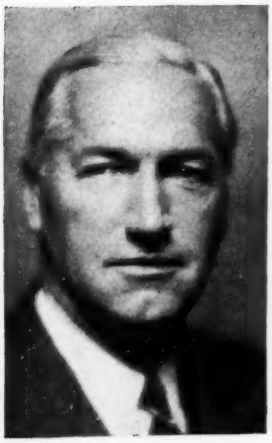
C. E. ROBINSON

Become Vice Presidents at United Aircraft

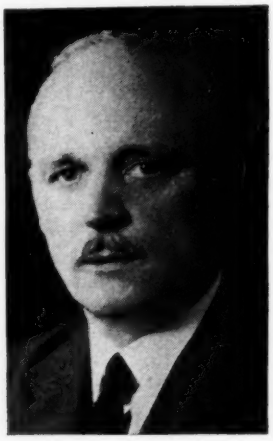
SIDNEY A. STEWART

CHAS. J. McCARTHY

Occupy New Executive Positions at Continental Can Co.



CARLE C. CONWAY



S. McKEWEN

PAUL E. PEARSON

Carle C. Conway has been named president of Continental Can Co., New York City, and at the same time will retain his office as chairman of the board. Sherlock McKewen, formerly assistant to Sidney J. Steele in Chicago who is now vice chairman of the board, has been appointed a vice president with headquarters in New York. Paul E. Pearson, formerly manager of the equipment manufacturing division has become vice president in charge of equipment development and manufacture in Chicago; and Jacob F. Egenolf has been advanced to vice president in charge of can manufacture in New York.

Holly M. Olson has been appointed chief mechanical engineer over all divisions of the Sealed Power Corp., Muskegon, Mich. Previous to his connection with the company in 1928 Mr. Olson was associated with Continental Motors Corp., and for the past several years has been chief mechanical engineer of the Piston Ring Division of the corporation.

Welling F. Thatcher has become management executive of Cross Gear & Machine Co., Detroit, and will assist Milton O. Cross, Jr. who is president of the firm. Recently Mr. Thatcher was president of U. S. Steel's subsidiary in Brazil.

Joseph J. Jilbert, for 20 years superintendent of Mattison Machine Works, Rockford, Ill., and machine shop superintendent of Ampco Metal, Inc., Milwaukee, has joined Stokerunit Corp. of Milwaukee.

Edward E. McGinley has been appointed chief metallurgist at the Youngstown district works of Carnegie-Illinois Steel Corp., while William F. McGarrity and A. T. Reichenbach have been given similar appointments at the Edgar Thomson and Irvin works respectively.

D. A. Shardelow has become district sales manager at Indianapolis for Republic Steel Corp. He has been connected with the Dayton sales office since 1936.

BUSINESS ITEMS

Wickwire Spencer Steel Co. has announced formation of a new subsidiary organization, Wickwire Spencer Aviation Corp., with administrative offices at 500 Fifth Ave., New York, N. Y., and plants in Virginia and Illinois.

Plan-O-Mill Corp., formerly located at Royal Oak, Mich., is now located in its new plant at 1511 East Eight Mile Road, Hazel Park, Mich.

R. L. Crane Machinery Co. will be located at 296 Delaware Ave., Buffalo, N. Y., on and after the first of March.

Detroit Rex Products Co. has established a regional sales and service office at 2308 Fourth Ave., North, Birmingham, Ala., with William A. Vensal as manager.

United Precision Products Co. has moved to larger quarters at 3524 W. Belmont Ave., Chicago.

Handy & Harman has announced the opening of an office in the Bendix Bldg., 1206 S. Maple Ave., Los Angeles, with H. A. Folgner of the New York office in charge.

Vern R. Drum & Associates has been organized as production engineers with headquarters in the New Center Bldg., Detroit. Mr. Drum has been consultant on manufacturing problems to the Cleveland Ordnance District, and was previously connected with several automobile companies.

OBITUARIES

Mason Hulett, 52, who had been in Washington for the past several weeks as chief, industrial gear and speed reducer unit, Material Handling Equipment Branch, WPB, passed away suddenly in Washington. For a number of years Mr. Hulett was connected with the Falk Corp., and more recently with Farrel-Birmingham Co. in the New York office.

Walter Kidde, 65, founder and president of Walter Kidde & Co., Bloomfield, N. J., died suddenly at his home. After serving an apprenticeship with Burhorn & Granger, consulting engineers, he opened his own offices in 1900 at the age of 23. A few years ago Mr. Kidde was awarded the honorary degree of Doctor of Engineering by Stevens Institute of Technology, and in 1941 he received the honorary degree of Doctor of Science from Rutgers University. He was a Fellow of the American Society of Mechanical Engineers.

WALTER KIDDE

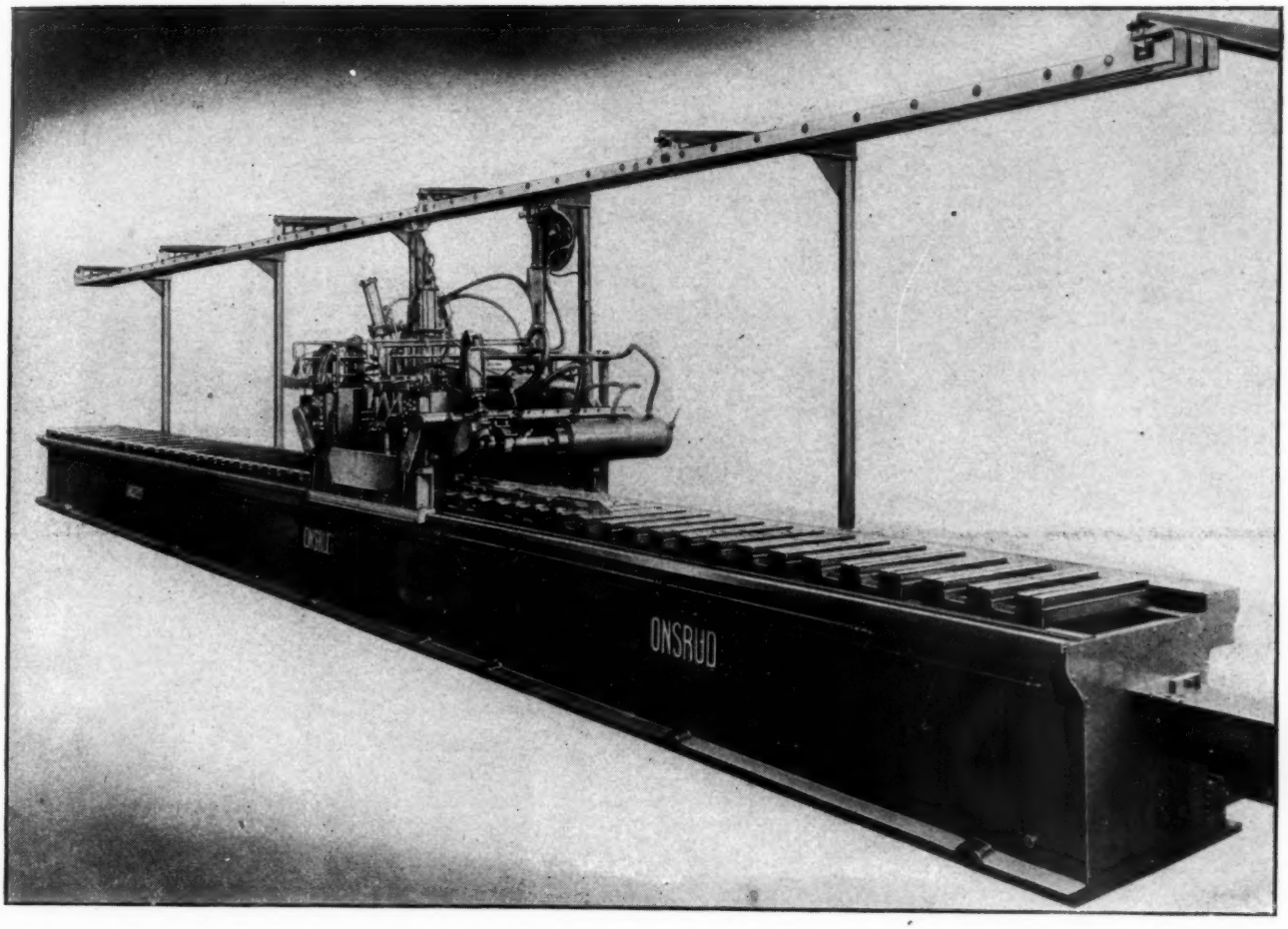
James G. Blunt, 74, assistant to the vice president in charge of engineering of American Locomotive Co., Schenectady, died after an illness of a year. He joined the Brooks Locomotive Works at Dunkirk, N. Y., in 1897 and became engineer for the drafting department of American Locomotive Co. when the Brooks company was merged with American Locomotive. Mr. Blunt received several advancements in position until his appointment in 1941 to the position he occupied when he died.

Willard G. Nims, 67, treasurer of L. S. Starrett Co., Athol, Mass., died after a month's illness. He had been employed by the company for 45 years.

Thomas Warner Larkin, 82, who was president of LeRoy Plow Co., LeRoy, N. Y., makers of farm implements, died at his home recently. He was secretary and general manager until 1916 when he was elected president.

Wichita City Library

SHOP EQUIPMENT NEWS



Onsrud Automatic Contour Milling Machine Built to Handle Long Aircraft Spar Beams

For milling long aircraft spar beams and similar parts, Onsrud Machine Works, Inc., 3910 Palmer St., Chicago, Ill., has announced the A80-A automatic contour milling machine. The bed of this machine consists of one or more cast iron sections in 7½ and 15 ft. lengths, any combination of which may be bolted together to secure the desired length of bed. T-slotted table sections 20-in. long are bolted to the ground surface of the bed. This type of construction allows the clamps to be placed below the surface of the table, and permits speedy loading and unloading of the machine.

The speed of carriage travel can be varied from 4 in., to 18 ft. 6 in. per min. The carriage is driven by a d.c. motor, giving stepless rheostat-controlled speed selection. Both manual and automatic control of the carriage speed are provided. Automatic control is through a cam bar, contoured in relation to the work. A roller connected to the drive motor rheostat follows the contour of the bar as the carriage moves forward. As the position of the roller changes the carriage speed varies.

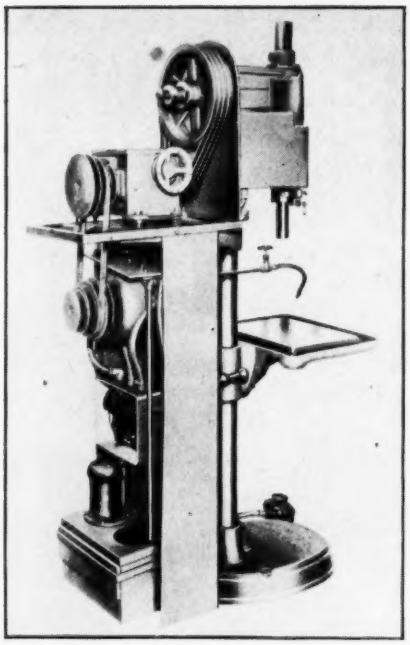
Two vertical and two horizontal cutters make it possible to perform up to four separate cutting operations on a single piece of material in one pass of the carriage. Proper sequence and degree of tilt are automatically controlled by a type of templet, which is shaped in correct relation to the work. Varying angle or twist cuts may be machined with this cutter. The second vertical cutter head can be tilted in a fixed position up to 15 deg. to the front or rear of the machine. Both horizontal cutter arbors are fixed in a horizontal plane, and can be raised or lowered within certain limits.

Cutter travel is by means of templets which are made to the shape of the finished work. The templet followers in traveling, or following the contours of the templet, cause the cutters to move under feed to machine automatically the shape desired. As the follower moves over the templet, the cutter of the assembly moves in the same direction through the work.

The working range from the table to the vertical motor is 2 to 11 in. Working range from the table to the center of the horizontal motor arbor is 3¼ to 11½ in. Maximum clearance of the work is 7 in. high, 20 in. wide. The table is 24½ in. wide, and height to the table surface is 36½ in. Maximum diameter for horizontal cutters is 9 in., and 3 in. for vertical cutters. The over-all width of this milling machine is 7 ft. 8 in. including trolley and duct posts. A 45 ft. machine weighs approximately 52,000 lb.

Cleveland Lead-Screw Tapper Has Dual Pushbutton Control

A Model DB, 16-speed, heavy-duty lead-screw tapping machine with a capacity of 1¼ in. National Coarse thread in steel has been brought out by Cleveland Tapping Machine Co., 1725 Su-



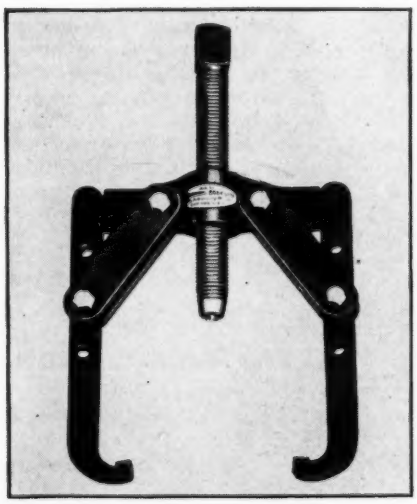
perior Ave., Cleveland, Ohio. This machine is dual pushbutton controlled, for either automatic or manual operation. A visible dial indicator is included for adjusting the reverse control which can hold the vertical travel of the spindle to within 0.005 in. limit.

The speed ranges from 45 to 300 r.p.m. are through a four-speed transmission and four-step V-drive pulleys. The final drive is through a four-groove sheave with a sensitive clutch.

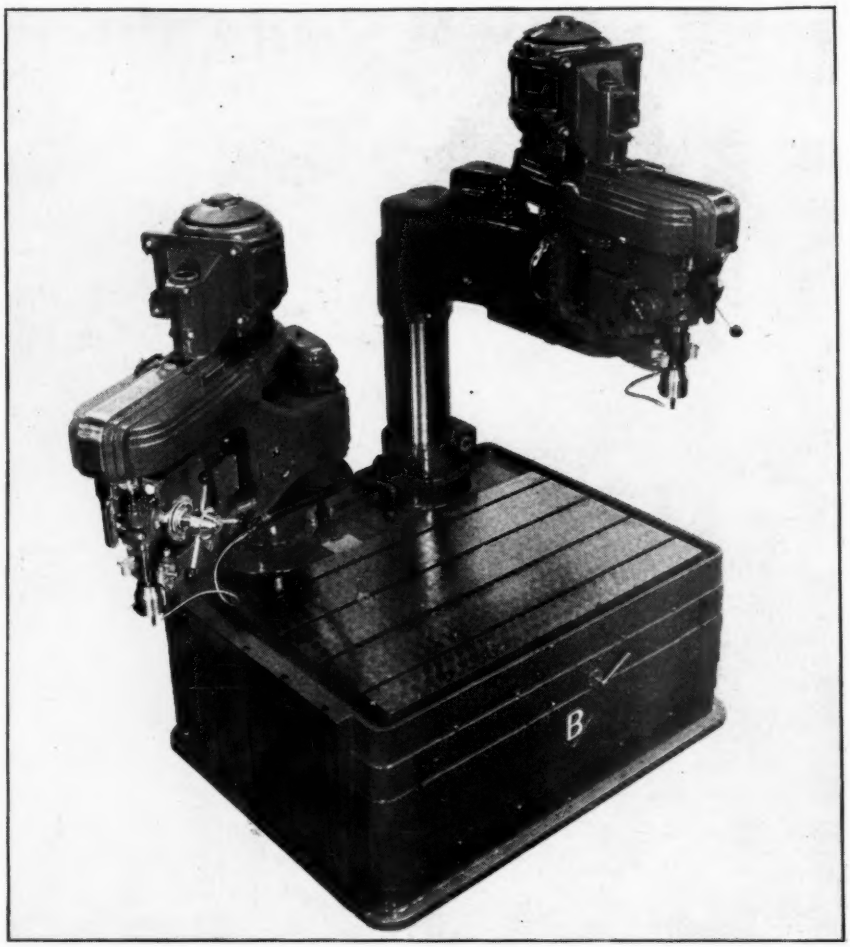
Steelgrip Rigid-Arm Puller Takes 6 and 8 In. Wheels

The Steelgrip rigid-arm gear and wheel puller developed by Armstrong-Bray & Co., 5364-78 Northwest Highway, Chicago, Ill., designed to hook over a gear or wheel, is now made in two new sizes. One size will take wheels, gears, etc., up to 6 in. in diameter, and another handles 8 in. diameter wheels.

The arms are drop forged steel, heat-treated, and have two positioning holes. They are equipped with swivel cap screws.



Bakewell Vertical Tapping and Threading Machines Available With One or Two Complete Tapping Heads



The necessity of second tapping to insure perfect threading is eliminated in the precision tapping and threading machines, announced by Bakewell Manufacturing Co., 2427 E. 14th St., Los Angeles, Calif. The No. 1 vertical tapping machine has a capacity of No. 4-40 to ⅝ in. in steel, and for larger size work the No. 2 machine has a capacity of ⅜ to 2 in. The machine is available with one or two complete tapping heads. The double head radial machine may be used for tapping two different sizes of holes, for working on two different pieces, or one head may be equipped with a drill.

The leading-on mechanism consists of a hardened and precision ground leadscrew which operates in conjunction with threaded brass guide fingers. These fingers lead the taps in and out of the hole by matched leadscrew threads. By this method the brasses are not engaged when the drive motor is idle, giving free traverse to the spindle and thus permitting the tap to be brought down to the work to center in the hole before tapping is begun.

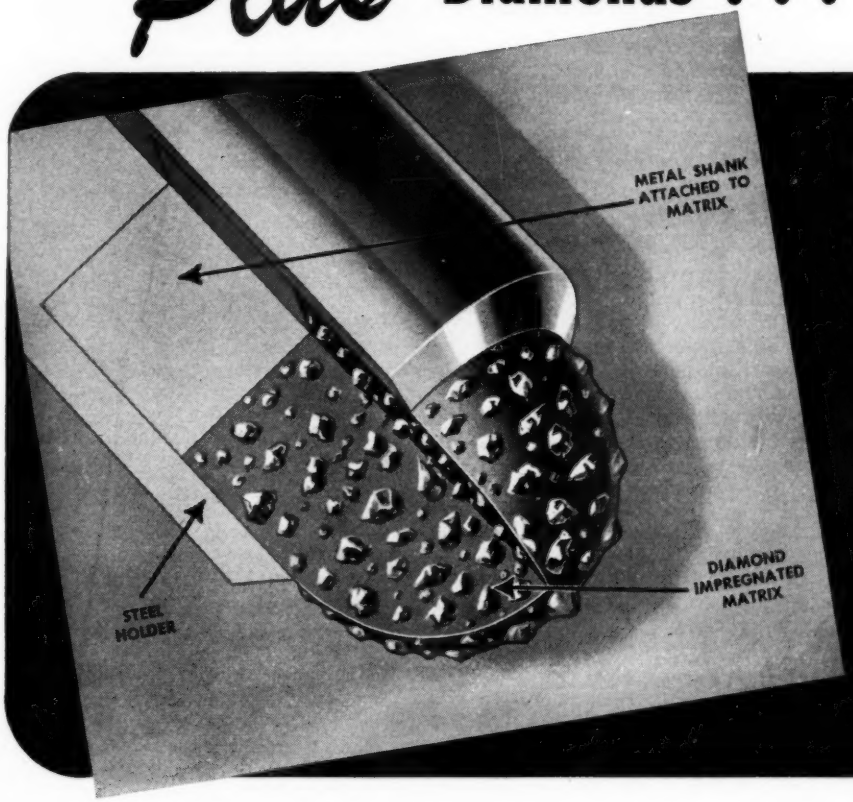
Depth of tapping is controlled by reversing the drive motor. A moving contactor working between adjustable upper and lower limit switches reverses the motor at the predetermined depth, and shuts it off at the end of the operation after the tap has left the hole. The limit switches are located in a housing which is an integral part of the tapping head casting. In setting the depth limits, the operator moves the indicator to the predetermined depth as calibrated on the dial by turning the inner knurled knob. The position is locked by tightening the outer knob. The lower limit reverts the spindle rotation by reversing the motor.

This machine will cut either internal or external threads, and right- or left-hand threads as desired. It is suited for cutting threads in plastic, aluminum and its alloys, die-casting, magnesium, nickel and stainless steels and chrome-molybdenum alloys and bronze.

A safety clutch is provided which can be adjusted to the safe torsional resistance of the tap and the type of the material. If the drive torque increases due to the tap becoming dull or from obstruction in the hole, the clutch will release, and thus prevent the breaking of the tap.

The table is 32 in. from the floor, and has a working surface of 28½x46 in., with four ⅝ in. standard T-slots. A vertical T-slotted table is provided on the left-hand side of the base to which an angle plate can be attached. Provision is made at the rear of machine for attaching an additonal worktable.

This Combination of Carboloy Cemented Carbide *Plus* Diamonds . . .



Gives You A Wheel Dresser *HARD TO BEAT!*

Here's what you get when Carboloy Cemented Carbide is "teamed" with diamonds to form one of the most outstanding grinding wheel dressers ever made available to industry:

1. **No accidental diamond loss!** The carbide matrix is actually moulded to the exact contour of the diamonds. Holds diamonds rigidly. Can't come loose!
2. **No remountings!** Simply give the dresser a ¼ turn in holder each day, and you get a new cutting surface.
3. **Maximum diamond consumption!** The carbide matrix holds diamonds on the job right down to the last small particle.
4. **Extra protection!** Extreme hardness of carbide matrix gives unusual protection to diamonds.
5. **Lower dresser cost!** Results on a wide variety of jobs show that you save at least 25% annually in diamond dresser cost.

Compare these advantages with the dresser you now use. Write for folder DR-100.

CARBOLOY COMPANY, INC., 11149 E. 8 MILE BLVD., DETROIT, MICH.

(Sole makers of the Carboloy brand of cemented carbides)

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Another USE FOR CARBIDES

CARBOLOY CEMENTED CARBIDE DIAMOND IMPREGNATED DRESSERS

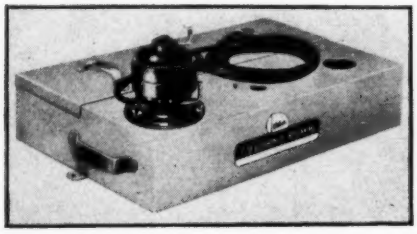
For GENERAL USE ON GRINDING WHEELS

Atlas Portable Coolant Pumps Are of Centrifugal Type Design

Two compact portable coolant pumps have been announced by Atlas Press Co., Kalamazoo, Mich., which meet maximum flow requirements of most makes of tools. They are centrifugal type units with a four-bladed impeller driven directly by the extended motor shaft, which is the only moving part below the motor. Coolant flow is controlled by the turn of a control valve, and no priming is required.

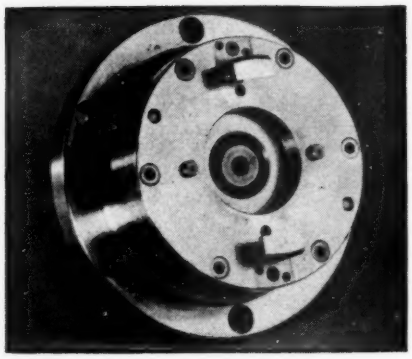
These pumps are equipped with heavy gage steel tanks, and openings are provided for the unit, feed and return tubing. A handle is provided at each end of the tank and two lugs are included for permanent installation.

The No. W89 coolant pump is equipped with a 110-120 volt, a.c.-d.c. 6,000 r.p.m. motor, and the No. W88 has a 3,450 r.p.m. induction type motor for 110-120 volt, 50-60-cycle, a.c. Tank capacities are 5 and 2½ gal. respectively.



Anker-Holth Air-Operated Chuck Has finger Compensating Units

An air-operated finger chuck has been introduced by Anker-Holth Manufacturing Co., 332 S. Michigan Ave., Chicago, Ill. The chuck has been designed to permit one finger to pull in farther than the other, thereby compensating for varying thicknesses of pieces to be held. Pieces are located from a fixed center stop position. For second-operation work it is said that close tolerances can be attained. The chuck body is flanged and drilled for direct mounting on the spindle nose. The piece is driven by two driving pins and the part is held against the chuck face by the two compensating fingers. The finger travel range can be made to suit requirements. The Airgrip chuck is designed for operation by company's high-speed revolving air cylinders in sizes from 3 to 18 in.



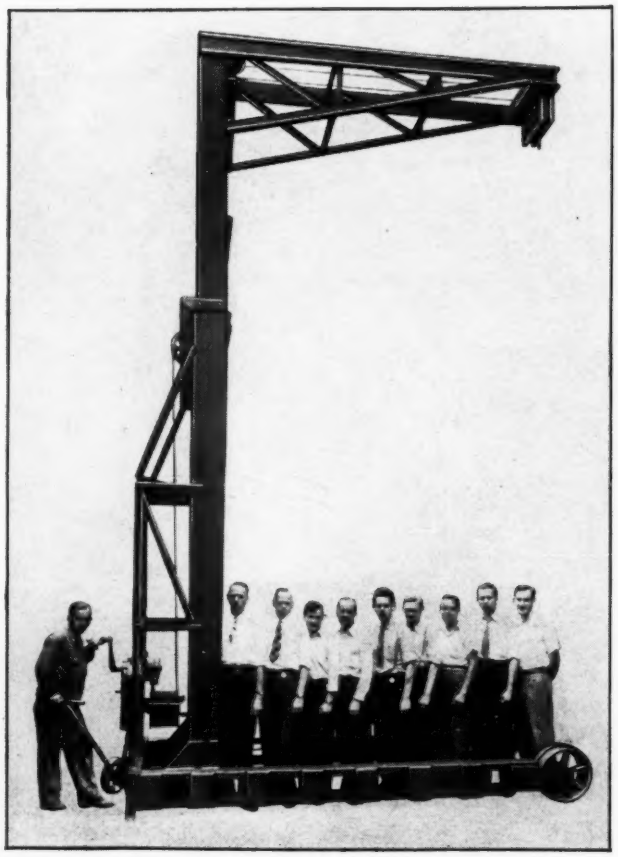
Barrett-Cravens Portable Crane Has A 20 Ft. Lifting Height

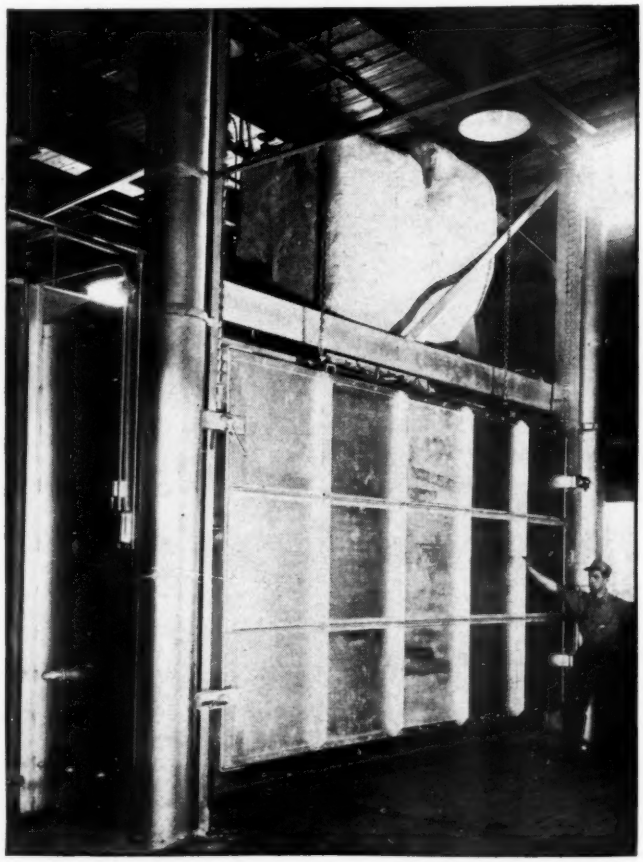
Barrett-Cravens Co., 3255 West 30th St., Chicago, Ill., has brought out a large portable crane having a capacity of 4,000 lb. and a lifting height of 20 ft. The boom length is 10 ft. and over-all height is 22 ft. The crane is telescopic in construction and collapses to a lowered height of 13 ft. 9 in. Among the uses for a crane of this size are for handling flywheels, moving dies in and out of presses, loading and unloading trucks and freight cars, and raising castings for machining.

Despatch Car-Bottom Furnace Removes Stresses in Weldments

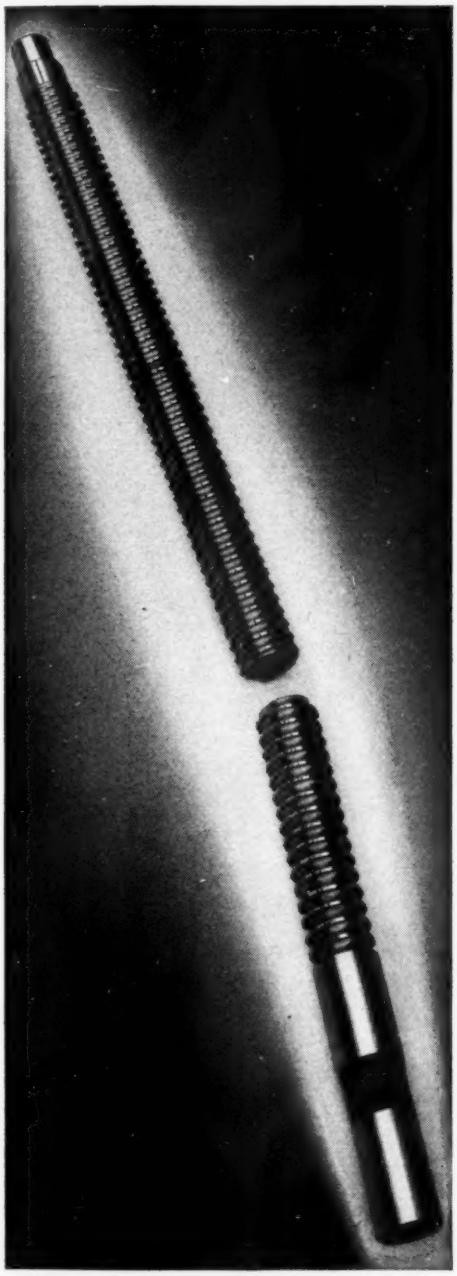
A car-bottom type stress relief furnace for removing stresses in weldments has been announced by Despatch Oven Co., Minneapolis, Minn. The furnace is equipped with automatic program control and the desired time and temperature are obtained through the entire pre-heating, soaking and cooling process. Rapid heat transfer and uniform heat maintenance in the work chamber permit large scale processing of a variety of weldments.

The weldments are loaded on heavy-duty insulated cars which enter the furnace through either of the two lift doors at opposite ends of the heat





2 SECONDS
would have saved this broach . . . . .



It may take 100 days to get a new one

How to get more production with your Broaches------

4. BY PROPER ALIGNMENT

It only takes a second or two to make sure that the piece to be broached is PROPERLY AND SECURELY seated in the fixture.

When parts are not securely seated they may "jump" into place while the broach is moving. If this happens the part tends to "cock" and jam against the broach, frequently resulting in tooth breakage if not breakage of the broach itself.

And, when you are broaching a cored or forged hole from the rough, it is safest to use an equalizing fixture to avoid localized high tooth loads tending to force the broach out of alignment.

For the same reason, a drilled hole should be square with the face or surface of the part against which it is located in the broaching fixture.

Simple precautions such as these will enable you to reduce broach breakage, reduce tool costs, and avoid production tie-ups.

Write for a copy of "Broaching News" Vol. IV, No. 8 for further details on "How to Get the Most Out of Your Broaches".

colonial BROACH COMPANY

Broaching Machines *Broaches-Broaching Equipment*

DETROIT . . . . . U. S. A.

chamber. The electrically operated doors at each end slide down smooth channels to form sand seals at both ends of the car. The work chamber is sealed by sand which is flowed mechanically along the sides of the car bottom. Heat is forced through distributing ducts by a large fan. Adjustable ports in each heat duct permit accurate control of the flow of air.

Acromark Nameplate Stamper Is a Pedal-Operated Unit

A No. 1F pedal-operated nameplate and parts stamping machine has been developed by Acromark Co., 7–13 Morrell St., Elizabeth, N. J. The pedal feature of this machine permits the operator's hands to be kept free for feeding the work. The machine requires very small floor space, and height is suited for the average operator to provide a minimum effort in operation.

Standard die sizes range from 1/16

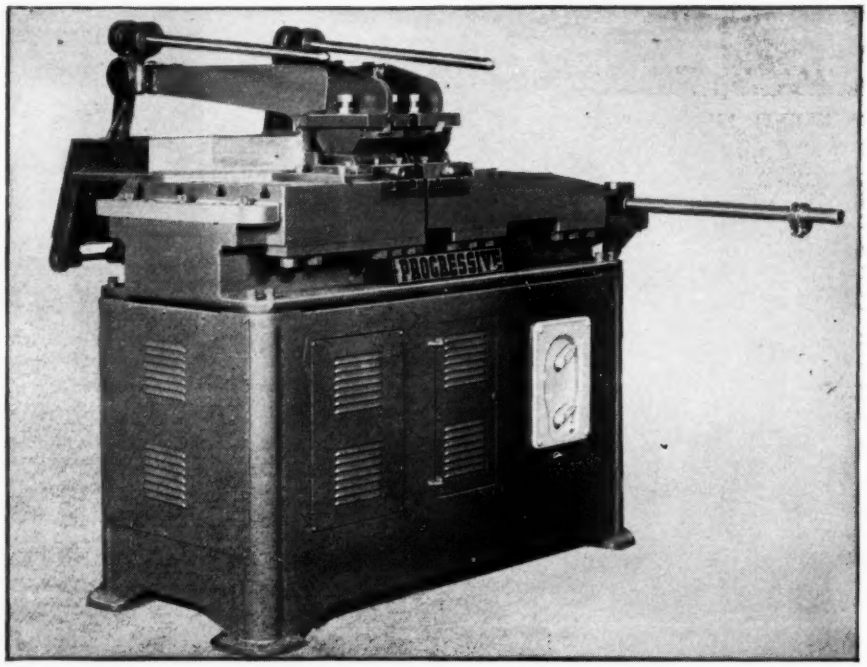
to 3/16 in. A marking head is included with the machine, with a full alphabet and set of figures as well as period, dash, comma, and diagonal line. Adjustment is from 0 to ¾ in., giving ample variation for thickness of nameplate and parts to be stamped.

Lyon Steel Carrier Frames Have Built-Up Wood Liners

Two sizes of steel carrier frames with built-up wood liners for storing and protecting precision machined parts have been announced by Lyon Metal Products, Inc., Aurora, Ill. The frame is a rectangular container without bottom, but having side walls formed into a channel shape to hold the wood inserts in position. It is fitted at each corner with a heavy steel lug to permit stacking. These lugs allow several frames to be fastened or stacked together to form one rigid unit.

Three types of wood inserts may be used, carriers with partitions, with holes, or with pegs. Frame size available are 30×20×5¾ in., and 30×30×3¾ in.

Progressive Develops Standard Line of Flash Welder Machines



The first of a series of standardized flash welders, the Model C rated at 150 kva., has been made available by Progressive Welder Co., 3001 E. Outer Drive, Detroit, Mich. A Flash-trol unit serves as a warning of an impending short-circuit in the welding arc and provides an automatic control to eliminate short-circuiting of the flash welding arc.

Upsetting speed and pressure are obtained through the use of a single and positive air hydraulic booster which forces oil at high speed into the platen traversing cylinder. The relay actuates the air cylinder which is tripped by the platen when the upset position is reached.

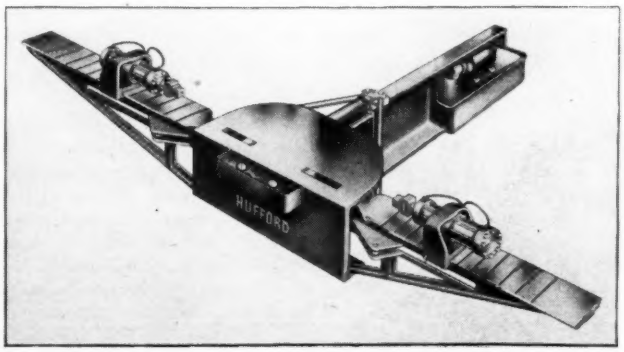
The platen feed pump on this flash welder is driven by a shunt d.c. motor powered from a single phase a.c. line, through grid controlled rectifiers.

Hufford Bending Machine Takes Rolled or Flat Strips

Designed for handling extruded rolled and flat strips of all shapes and many materials, Hufford Machine Works, Inc., 315 Diamond St., Redondo Beach, Calif., has announced an hydraulic bending and beveling machine. It consists of a stationary table which carries the forming die and two simultaneously actuated arms which are hydraulically operated and hinged to the table. The pivotal position of the arms can be moved to accommodate work pieces of various radii. An additional hydraulic cylinder is carried on each arm, adjustable for position along the arm to accommodate various lengths. The arms are equipped with suitable adapters and grippers to hold the work piece.

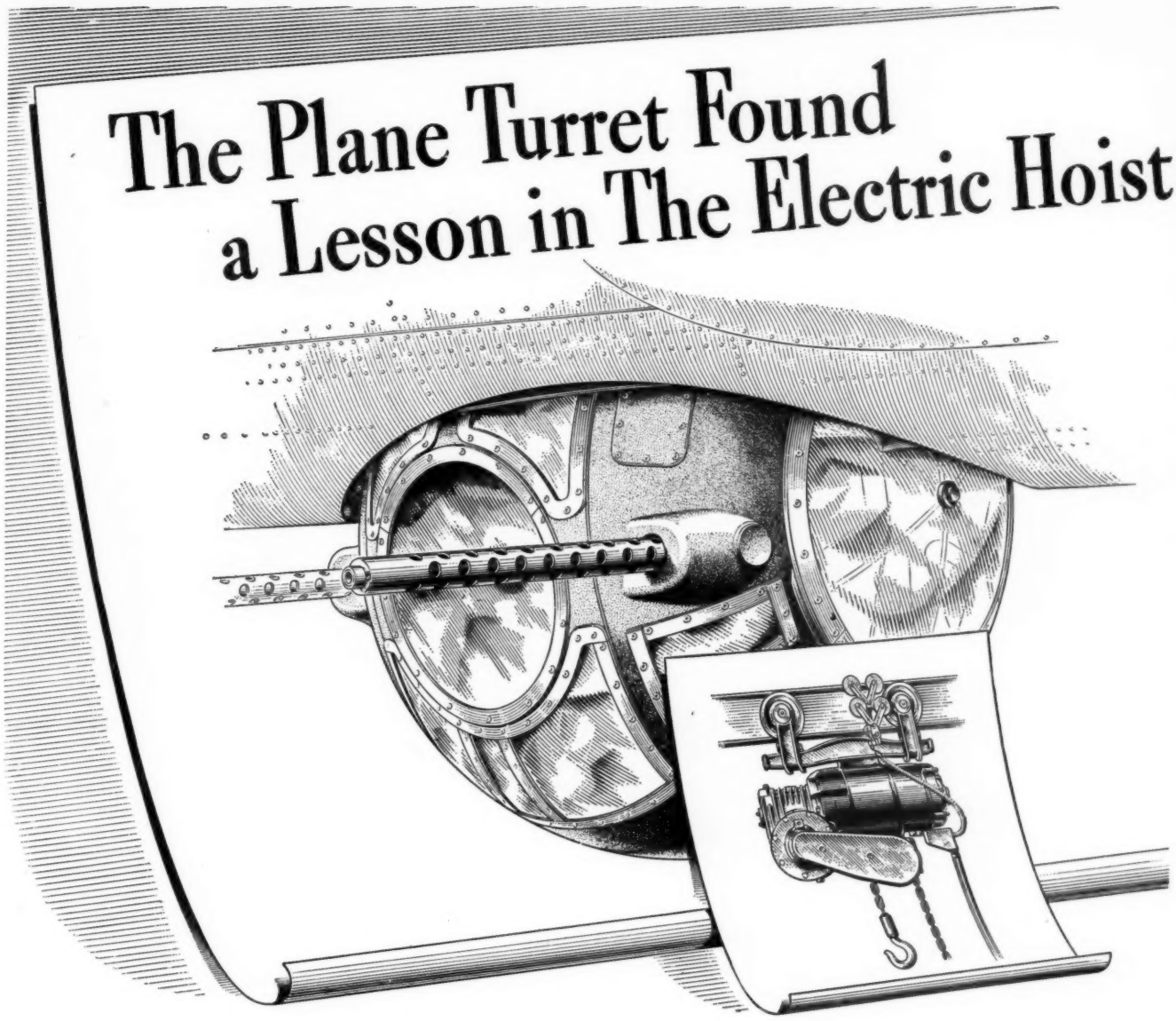
Bending is accomplished by stretching the extrusion between the two hydraulic cylinders and wrapping or bending the strip around the die while under tension. The metal will flow into the desired shape without wrinkling upon proper initial tension, and close tolerances can be maintained.

Forming dies can be made of hardwood to approximate shape, easily tested and corrected for springback, then faced with ordinary steel plate or aluminum alloy. Each die is in-



The arms are equipped with adjustable cylinders to take work up to 200 in. long

The Plane Turret Found a Lesson in The Electric Hoist



THERE'S not much in common, perhaps, between a hoist and a bomber turret. The hoist works day and night—constantly starting and stopping, frequently overloaded, seldom lubricated. That's why hoist manufacturers turned to the Torrington Needle Bearing to make product performance more dependable.

The plane turret, on the other hand, performs its task in a single, short, action-crowded interval, followed by thorough overhauling. But in those few swift moments of aerial combat, there's no leeway for the failure of *any* part. So turret designers, too, selected the Needle Bearing, to give reliable performance—and many other needed features as well. Quick response, for example, as the gunner pivots and somersaults to keep an enemy fighter in his sights—that comes from the Needle Bearing's low starting friction. A few more inches of space in the turret's cramped quarters, made possible by the bearing's small size. More rounds of ammunition or more gallons of fuel on board—result of the bearing's weight-saving features. And faster turret production because of the bearing's ready availability.

WHEN YOU DESIGN YOUR POST-WAR PRODUCTS, there may be a hint for you in a bearing as versatile as this. Long life, high load capacity, faster speeds, compact design, less need of attention—aren't these just the features your customers will be looking for? Torrington engineers will show you how you can give your product these advantages with the Needle Bearing. For preliminary information on sizes and ratings, and for a list of many typical applications, write for Catalog No. 105.

THE TORRINGTON COMPANY

Established 1866 • Torrington Connecticut, U. S. A.

Makers of Needle and Ball Bearings

New York Boston Philadelphia Detroit
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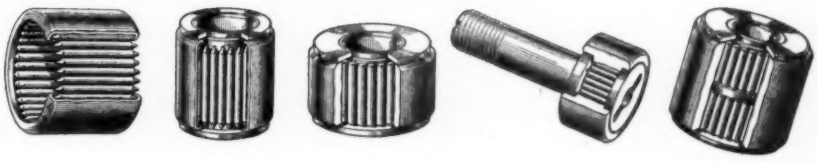
KEYED TO TODAY'S NEEDS

AND TOMORROW'S TRENDS

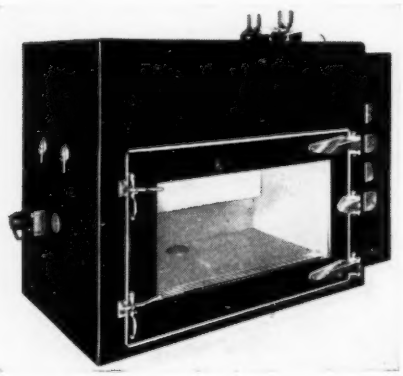


dexed for cylinder location, pivot location and operating pressure at the time of the initial run. Identical parts can be subsequently made by duplicating these factors.

Bending and beveling are uniformly accomplished in a single operation during which the material can be twisted around on its own normal axis, or its cross-section can be modified by changing the angular relation its sections. The machine has work capacity length of 12 to 200 in. The maximum cross-section size is 7×7 in. The die width ranges from 6 to 120 in. The machine is equipped with a 10 hp., 220 or 440 volts, 3 phase motor. Shipping weight is 12,000 lb.

American Instrument Tester Has Wide Temperature Range

A chamber for testing instruments under extremes of cold and heat has been announced by American Coils, Inc., Newark, N. J. The range of operating temperatures of this unit is from —55 C. to +70 C. This Model RTC-1 unit consists of a two-stage condensing unit, liquid subcooler, heat exchanger, expansion valves, coil or evaporator, and forced draft strip heater. Operation of this chamber is controlled from a front panelboard where the master switch is located along with the off-fan control,

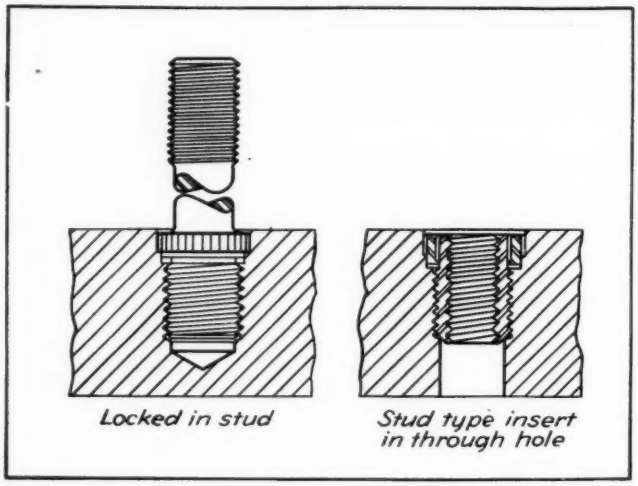


light switch and receptacle switch. In addition to providing temperature uniformity, this unit assures positive air circulation.

The compressor maintains the refrigerant temperature in the coil and is controlled by a pressure switch. The coil is located above a divider partition upon which are located the fans and dampers controlling the quantity of air which passes over the coil. When the master switch is in the refrigeration position, the heater circuit is automatically disconnected. A solenoid valve located in the liquid line automatically pumps the coil dry of refrigerant when the master switch is in neutral or in heater position. A hand-operated valve is located in the same line for use under special conditions.

The cabinet is all-steel, and occupies a space 83 in. wide, 56½ in. high and 42 in. deep. The interior content of the unit is 28.7 cu.ft. An inner glass door provides view of instruments.

Rosan Locking Unit System Has Serrated Stud and Ring



This locking system is adaptable to any functions performed by ordinary studs and inserts

Announcement has been made by Bardwell & McAlister, Inc., Hollywood, Calif., of the Rosan locking unit. The system consists of a ring serrated inside and out and a stud. The stud is installed by usual methods and the serrated ring is forced into the counterbored hole and over interlocking serrations built into the stud head, making a tight fit flush with the surface of the work piece. Similarly, the insert may be locked in place by means of the same interchangeable ring.

This locking system can be adapted to any function performed by ordinary studs and inserts such as fastening clamps to light jigs and fixtures, where a solid type insert is used for holding moving parts on jigs to close limits.

Threaded inserts are also available for insertion in wood or plastic, using the ring for locking purposes. A stud or capscrew can then be screwed into the insert. In service, inserts can be installed in place of a stud which has been pulled out and a capscrew or similar stud used.

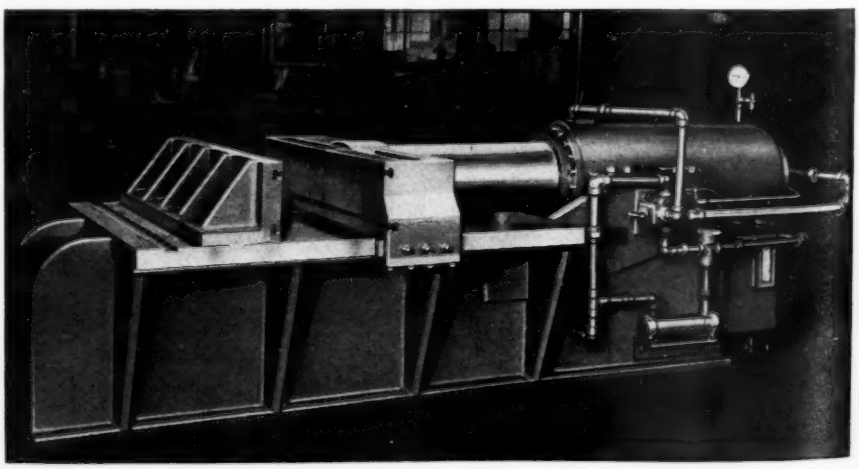
While the number of teeth on the outside of the insert collar vary with the size of the part, approximately the same shape is maintained on all. Clearance between the inside of the ring and the outside of the collar varies from 0.006 up, depending upon the size of the insert. This clearance permits easy engagement, but disappears as the ring is compressed by the surrounding metal against the insert.

The ring is fitted along its outer periphery with other splines to prevent the insert from turning in its location. When seated in either soft or hard material these splines, by broaching their way into the material, hold the ring and through the interlocking arrangement with the mating part hold the insert firmly in place. Although the Rosan locking system has been used largely in aircraft production, it is suited for other applications.

Beatty 200-Ton Bulldozer Has 60 In. Maximum Opening

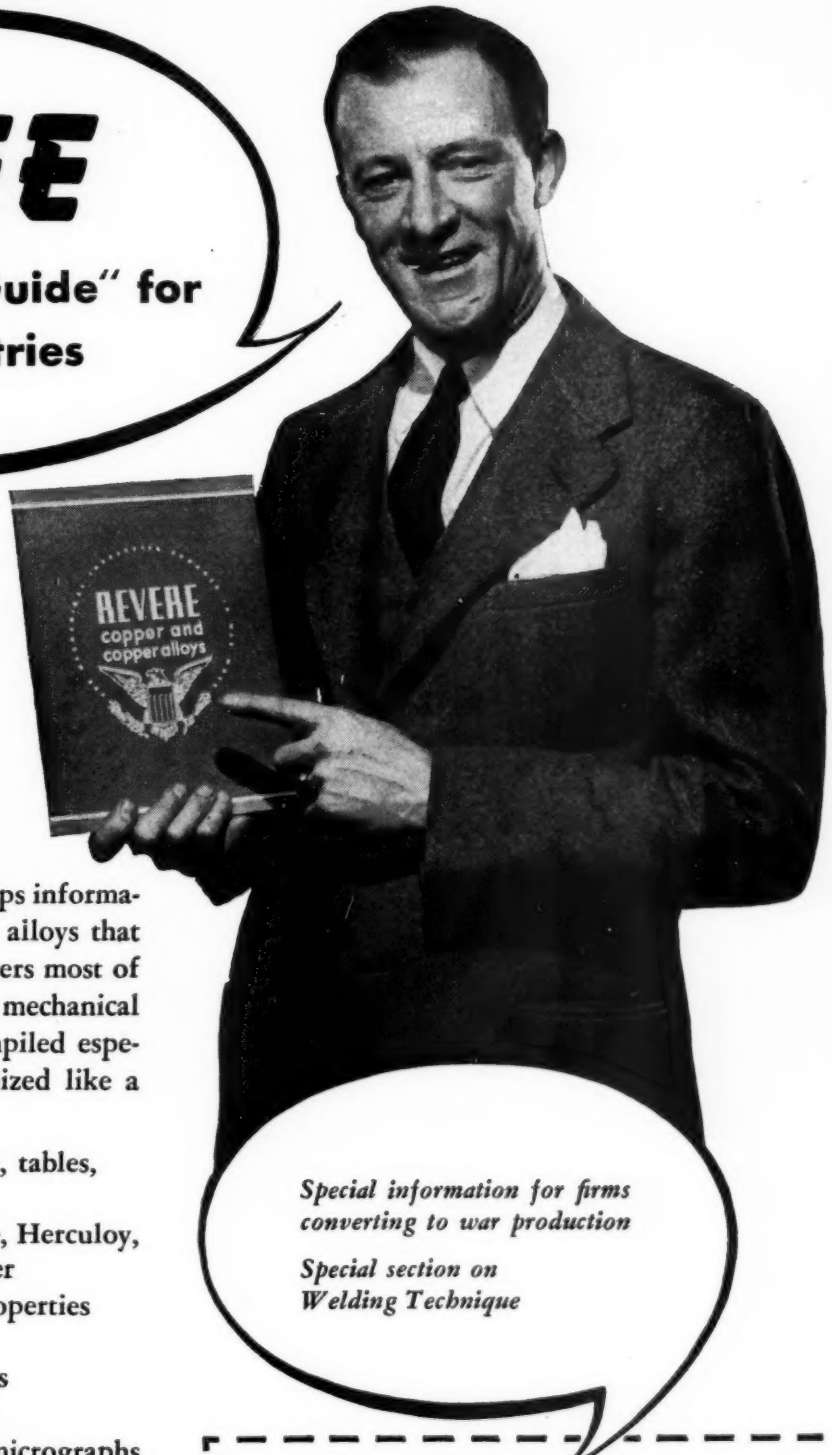
A 200-ton hydraulic bulldozer has been introduced by Beatty Machine & Mfg. Co., Hammond, Ind. The machine has a 36 in. stroke, adjustable shut height of 14 or 24 in., with maximum opening of 60 in. Measurement of the ram head is 12×60 in.

The table measures 60 in. long. The pressing speed of this machine is 20 in. per min., and return speed is 60 in. per min.



FREE

New "Copper Guide" for war industries



Here is a book that puts at your fingertips information about Revere copper and copper alloys that users most frequently need. That answers most of the questions asked of Revere by the mechanical industries engaged in war work! Compiled especially for your use today. And organized like a handbook for easy reference.

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Technology of the alloys
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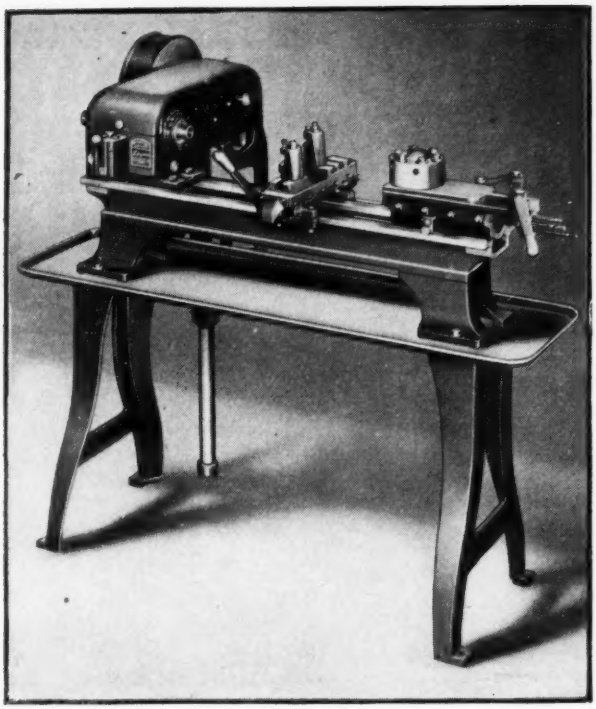
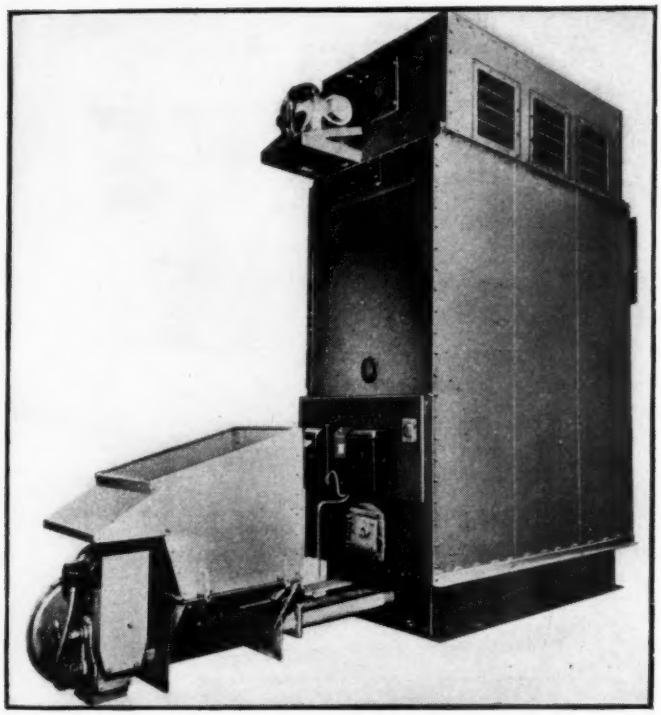




Logan Hand Screw Lathe Handles 5/8 In. Bar Stock

Logan Engineering Co., 4912 Lawrence Ave., Chicago, Ill., has introduced its No. 830 hand screw machine with round bar stock capacity of 5/8 in. diameter or less. It has been developed to release larger machines for heavier work.

The lathe has a precision ground bed with two prismatic V-ways and two flat ways, and preloaded ball bearing spindle mounting. Turret holes are bored from the headstock. The turret and cross-slide are provided with adjustable gibs. A speed collet chuck for handling round work, which may be fed through the spindle and bar feed attachment, are offered as accessories.

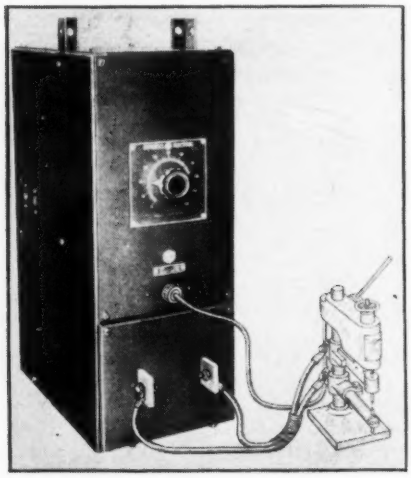
Dravo Self-Contained Heater Is Built for Burning Coal

A direct-fired coal burning heater has been announced by Dravo Corp., Pittsburgh, Pa. It is equipped with an under-feed stoker of either bituminous or anthracite type and either hopper or bin feed, also available for hand firing with undergrate fan. Sizes average from 1,000,000 to 4,000,000B.t.u. per hr.

The heater is self-contained, having its own combustion chamber and distributes warm air either directly from outlet vents into the area to be heated, or through a duct system when partitions or obstructions make it necessary. Ample furnace volume is provided for the fuel to burn without smoke before the gases strike cold surfaces. A tightly welded combustion chamber prevents the infiltration of excess air.

G. E. Synchronous Control Designed for Spot Welding

For precise operation of resistance welding machines, General Electric Co., Schenectady, N. Y., has developed an electronic half-cycle, synchronous control which is furnished in two types. The CR7503-A136, which includes a welding transformer, is designed for bench mounting. The type CR7503-A133, without a transformer, is suitable for wall mounting. Both types can be used with tongs or a suitable bench welder.

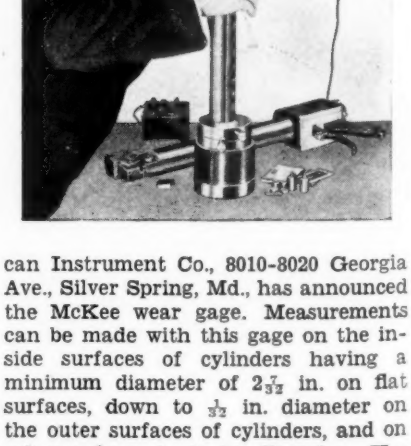


The control features a new tube and new circuit which makes higher speed welding possible. The unit includes heat control by the phase-shift method, and heat adjustment is made by a dial mounted on the front of the cabinet.

This control facilitates the welding of tinned copper, steel, or alloy wires; of studs from 0.01 to 0.05 in. diameter to flat surfaces, and the spot welding of pieces less than 0.01 in. of stainless or mild steel, nickel, or silver to brass or bronze. The control will also handle the welding of low resistance joints which are unaffected by temperatures in excess of 125 C.

McKee Wear Gage Measures Inner and Outer Surfaces

For measuring the amount of material removed from metallic surfaces after being subjected to wear, abrasion, grinding, honing, lapping, etc., American Instrument Co., 8010-8020 Georgia Ave., Silver Spring, Md., has announced the McKee wear gage. Measurements can be made with this gage on the inside surfaces of cylinders having a minimum diameter of $2\frac{7}{32}$ in. on flat surfaces, down to $\frac{1}{32}$ in. diameter on the outer surfaces of cylinders, and on spheres down to $\frac{1}{4}$ in. diameter. The maximum amount of wear that can be measured is 0.0014 in., and the mini-



Why Does a Cutting Fluid Work?

A statement of tremendous importance to all interested in metal machining

TO DEVELOP NEW and greatly improved types of cutting fluids—made possible by increased knowledge of the chemical and physical functions of such materials—has been the aim of Quaker Chemical Products Corporation ever since we were convinced that the current knowledge of such products was, and still is, in its infancy.

Much has been written about fatty oils, sulphurized fatty oils, sulphurized mineral oils, chlorinated fatty oils and mixtures of all of these. But a close study shows many inconsistencies and a lack of definite *knowledge*. A great many statements made were based upon *theory* . . . or intelligent guesses.

So, some years ago we set aside a portion of our research laboratory, picked three outstanding men from our own research staff and assigned to them the task of replacing these theories and guesses with definite scientific knowledge.

Obviously, if we could find out just exactly what is needed to lubricate and cool a cutting tool and could measure this in the laboratory, the entire field would progress by leaps and bounds. Naturally, we have not yet learned all the answers . . . nor can we yet effectively measure in the laboratory just what a cutting fluid will do in practice . . . but we *have* taken many long steps toward our ultimate goal.

Sulphurized . . . But How?

When harder steels, tougher cuts and higher speeds made it necessary to improve the quality of mineral lard oil, the addition of sulphur constituted the first real advance. A little later sulphur was cooked into a combination of mineral, animal and vegetable oils. These sulphurized fatty-mineral oil combinations turned out cooler and better work than mineral lard oils or plain sulphurized mineral oil.

But our laboratory studies opened up another important angle. It soon became evident that it wasn't only the *amount of sulphur* or the *kind of fat sulphurized* that determined results. **The sulphur must be combined in just the right way, so that it will be *released gradually* . . . only to the extent required to prevent metal-to-metal contact . . . otherwise the sulphur content of the oil is rapidly exhausted and tool life is materially shortened.**

Thus, it is not sufficient to distinguish between "free", "combined" and "active" sulphur in cutting oils. The *rate of release* of the combined sulphur is of principal importance and can be determined only by practical machining tests . . . and not by any of the laboratory methods, such as the copper test, now in vogue.

New Process of Polymerization Found Effective

Further research in methods of combining sulphur led us into the treatment of fats and fatty waxes not heretofore used in cutting fluids. These were treated differently —by *polymerization* or a building up of the molecules. Next we found that *high pressure* and the use of a *catalyst* gave even better results. **Finally our laboratory succeeded in producing a sulphurized, polymerized fatty wax which not only permits the sulphur to be released over an extended period of time but which also possesses extreme pressure properties as well as excellent lubricating, cooling and anti-weld qualities.**

What This New Type Product Does

Primarily, this new material is a "base". That is, it is a concentrated product that must be blended with a vehicle such as ordinary mineral oil. When diluted in this manner, this advanced type of cutting fluid replaces present types of ordinary sulphurized cutting oils.

Numerous reports in our files attest to the considerably increased production being achieved in many plants with this new product which makes possible greater speeds and feeds . . . with longer runs between tool changes. On a difficult cutting operation where tools are being changed once or even twice during an eight-hour shift, it is quite common for a **Quaker Process Engineer** to put this new product on the job and entirely *eliminate* these tool changes *during* shifts . . . enabling them to be made *between* shifts only. This often means a saving of almost an hour per machine per shift. Think what this can mean both in the saving of hard-to-get tools and also in terms of increased production of parts for the planes, guns and tanks needed to speed the day of Victory!

Production Data Available

Authentic plant production data sheets containing complete figures on various machining operations with this new cutting base are available on request. They are actual reports from **Quaker Process Engineers** in the field and contain no advertising or "sales talk".

If you care to know more about how this new product can be of value to you, we suggest that you have a talk with a Quaker Process Engineer. These men speak your language and know how to translate our new developments into increased production in your plant. Please don't confuse them with ordinary salesmen—for before they came with us these men "cut their eye teeth" as factory chemists, metallurgists, methods engineers, or superintendents of industries such as yours. They are familiar with production problems—they deal with known facts—and they speak with authority. If you'd like to talk shop with such a man, write or wire us today.

QUAKER CHEMICAL PRODUCTS CORP.

CONSHOHOCKEN, PA.

mum wear detectable is 0.000015 in. Measurements can be made at any distance on the inside of the cylinder up to 10 in. from the end of the cylinder, and on any accessible spot on outer surfaces.

This wear gage consists of the indenter, measuring microscope, cylinder indentation locater, and polishing templet. The instrument is supplied with a multiplying factor for converting microscope reading to indentation depth. If the surface is curved, correction is made to the depth measure by referring to a correction formula and table which is supplied with the instrument.

American-LaFrance Pump Tank Suited for Magnesium Fires

For controlling magnesium type incendiaries American-LaFrance-Foamite Corp., Elmira, N. Y., has introduced a pump tank which produces a straight stream. It has an oversized air chamber assuring minimum pulsation, steady pressure and constant stream with a range of 30 to 40 ft. The unit is self-

contained and is equipped with a standard 26 in. hose. The interior has a corrosion-resistant coating and the outside finish is red enamel also designed to repel corrosion. The tank is available in 2½ and 5 gal. sizes.

Aget-Detroit Dust Collector Available in Portable Type

A portable Dustkop dust collector, built for operation on 25 or 60 cycle a.c. has been brought out by Aget-Detroit Co., 2040 Book Bldg., Detroit, Mich. It is suitable for collecting dust and dirt from tool, cutter, precision and similar grinding operations. Air velocity is at

the rate of 600 ft. per min. For proper fan feed an overdrive countershaft is employed.

It is available with either one or two inlets. The dust and dirt-laden air, which is pulled away from the grinder wheels by the belt driven fan, receives an initial cleaning in the dust removal pan located below the drum-type filter and while passing through the baffles in the filter. A final cleaning stage is the filter material itself. The recirculation of cleaned air into the working space obviates the need for long connecting ducts to the outside wall, and reduces the amount of heat required. By lifting off the filter and dumping the dust collecting pan, the dust is removed from the unit.

Grinding Machinery Etcher Marks All Types of Metal

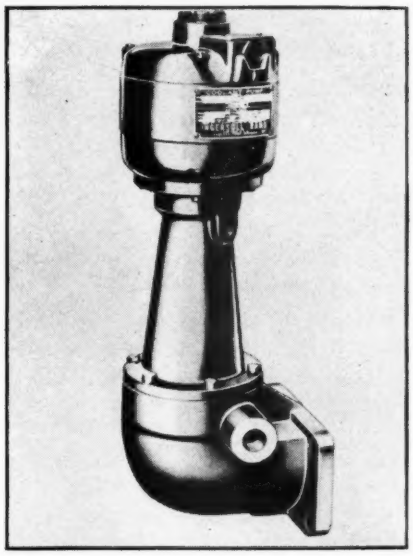
A combination etcher and demagnetizer has been announced by Grinding Machinery Co., 2832 E. Grand Blvd., Detroit, Mich. It is a portable unit suited for marking every type of metal. The etcher is equipped with an alloy-tipped marking stylus of the grindless type with self-cooling handle and 6 ft. of rubber insulated connecting cord.

Three connecting terminals offer a choice of etch depths to suit each job. When properly grounded the stylus may

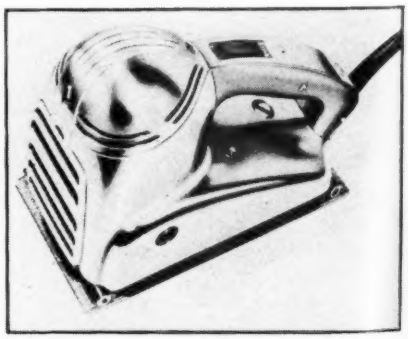
be used for soldering or drawing temper on small parts. Two demagnetizer poles at the top may be energized by switch at the front, the work being quickly demagnetized by passing it over or between the poles. A red indicator light shows when either the etcher or demagnetizer is operating.

Ingersoll-Rand Coolant Pump Can Be Installed On Machinery

Pumps suitable particularly for installation on machinery requiring a coolant or circulating unit, such as lathes, drills, automatics, cut-off machines and grinders where a constant supply of



cooling fluid or cutting oil is necessary, have been announced by Ingersoll-Rand Co., 11 Broadway, New York, N. Y. These pumps include ¾ and 1 in. side wall mounted types, a 1¼ in. side wall mounted type for low submergence applications, and a 1¼ horizontal type.



Sterling 1000 Portable Sander Has Detachable Sanding Pad

The Sterling 1000 portable electric sander has been announced by Sterling Tool Products Co., 363 E. Ohio St., Chicago, Ill. This vibrationless unit is compact in size with a handle designed to comfortably fit the hand of either men or women operators. A snap-action switch is located on the handle.

A detachable sanding pad operated

Correct Grinding Methods

Extend tool life

RULE 3

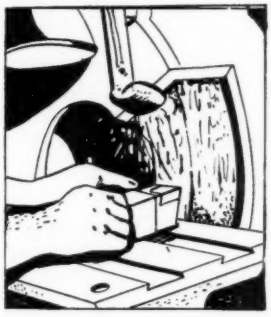
Use Care in Finish Grinding KENNAMETAL* Tools

STYLE 3 TOOL

FINISH GRINDING KENNAMETAL TOOLS

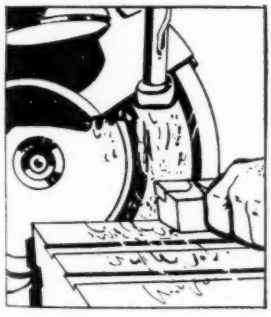
GRIND TOP

In finish grinding it is best to use the face of a large cup or rim wheel as shown. The top of the tip is ground first, setting the table rest at the finished side rake angle desired.



GRIND END

Set table rest at the finished front clearance angle desired. If the clearance on the tip is made 2° to 4° less than the clearance on the shank, the wheel contact will be on the carbide tip only.



GRIND SIDE

Grinding the side clearance and side cutting edge angles is the last step in finish grinding KENNAMETAL tools. As in roughing, wet grinding is preferred.

For finish grinding of KENNAMETAL, a large cup or rim wheel between 90 and 120 grit on a wet grinder is recommended. Keep the tool moving back and forth across the wheel since the large tool rest used to true up the angles does not permit rocking the tool. Dressing the wheel with about 1/32 inch of crown in the center of the face decreases the area of contact and permits better cooling. If the finishing must be done dry, be very careful to keep the wheel sharp enough that no heat coloring shows on the tip or shank steel at any point. Tool radius is formed by rotating tool from the side cutting edge to the end cutting edge, blending the radius tangent to the side and end cutting edges.

Diamond impregnated bakelite wheels of 220 grit are very satisfactory for finish grinding. Honing is reported to increase tool life on light cuts.

KENNAMETAL THE All American CARBIDE

*INVENTED AND MANUFACTURED IN THE U. S. A.

McKENNA METALS Co.

103 Lloyd Ave., Latrobe, Pa.

Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York
(Exclusive of Canada and Great Britain)

Trade Mark Reg. U. S. Pat. Off.

by a latch-type lock takes one-third sheet of abrasive and is made flexible to permit sanding on curved or flat surfaces. Tumbler action clamps lock the sheets on the sanding pad. Sanding action is by orbit motion to achieve a smooth surface on wood, composition or metal. The sander is driven by a 1/5 hp. universal motor cooled by a turbine-type fan, and protected from dust by a replaceable filter screen. The Sterling 1000 will also do many lapping and polishing operations by use of a felt or cloth matrix on the sanding pad.

Monitor Thermaload Starter Suits Small Space Requirements

A Thermaload V Solenoid Motor Starter has been announced by Monitor Controller Co., Baltimore, Md. Because of its small size, installation can be made in small spaces. Among the features of this unit is the bi-metal concentrated overload relay. The trip occurs within the same time at a given percentage of overload, thus assuring full overload protection. A further safeguard for the motor is an arrangement which prevents the operator from improvising any method to hold the

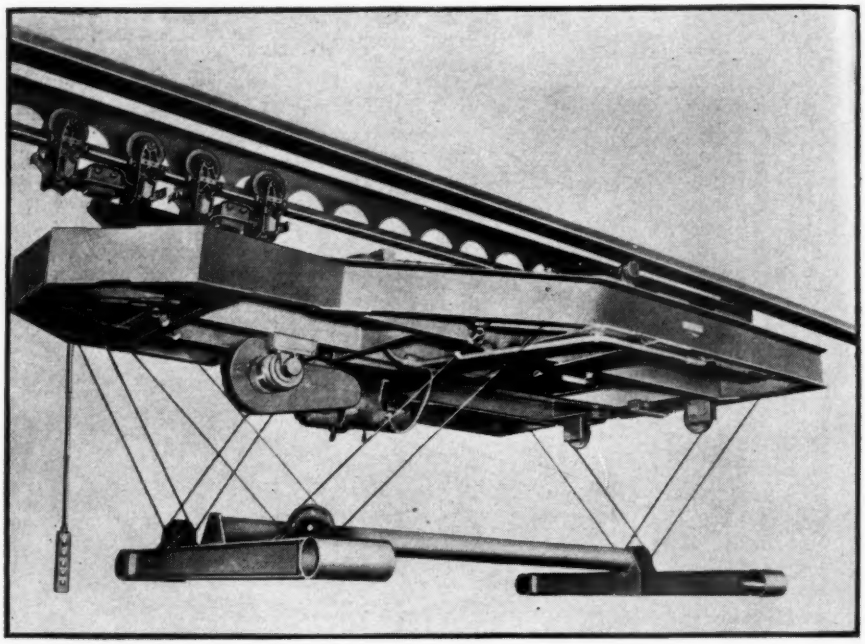
starter button in the "on" position. The operator must press the button and release it before contact is made.

This starter has a shockproof mounting, double-break contact of silver, and coils that are interchangeable for different voltages. This unit measures 5¾x5¼x4⅛ in., and is available in sizes 1.5 to 7.5 hp., and 110 to 550 volts, alternating current.

Dayton Rogers Spacing Collar Has Adjustment of ⅛ In.

A heavy-duty adjustable spacing collar for milling machine cutter arbors having a hardened and ground backing plate is offered by Dayton Rogers Manufacturing Co., 2830 South 13th Ave., Minneapolis, Minn. It has a maximum over-all adjustment of ⅛ in. by half thousands. This collar is provided with an engraved indicator showing which way to make the necessary adjustment.

Cleveland Tramrail Carrier Holds Unbalanced Load Rigid

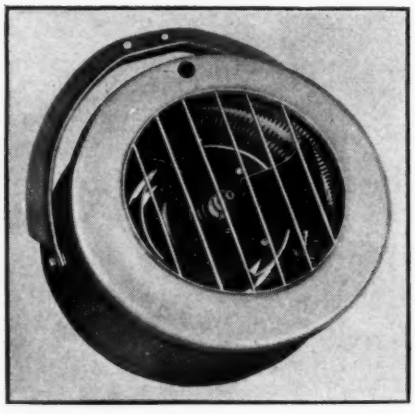


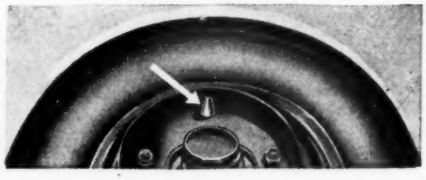
A stabilized tramrail carrier which holds a load rigidly in place by the use of ropes to form a triangular suspension has been brought out by the Cleveland Crane & Engineering Co., Cleveland Tramrail Div., Wickliffe, Ohio. A load can be raised or lowered through a considerable distance and will remain rigid even if the load is unbalanced. This carrier has been designed to permit the tilting of a load in either direction with relation to the rail on which the carrier is propelled. Through the use of a trunnion-type load bar the load may be rotated.

The stabilized carrier may be operated on two standard Cleveland tramrails, or on a double girder tramrail crane bridge. It may also be operated on the regular type overhead Cleveland tramrail. Carriers are available for capacities of one, three and five tons, hand or electrically propelled, with motor-driven hoists.

G. E. Forced-Convection Heater Adapted to Floor or Wall Use

For use in shipyards, crane cabs, and many out-of-the-way places General Electric Co., Schenectady, N. Y., has introduced a forced-convection heater which is controlled automatically, and rated from 2 to 15 kw. The unit is available in the suspension type for wall and ceiling mounting. The portable type, intended for floor mounting, is adaptable for either wall or ceiling use. It has an electric outlet connection, and operates on 230 volts, 60 cycles, alternating current.





Streeter-Amet Makes Lok-Ons For Locking Truck Wheels

Lok-Ons, in nut and bolt types, for locking truck wheels have been introduced by Streeter-Amet Co., 4101 Ravenswood Ave., Chicago, Ill. They are made of hardened steel and in different combinations to give maximum protection and require no key, tumbler or pins. Wheel balance is not disturbed by their use on the wheel, mounting is simply by unscrewing a lug nut or bolt from each wheel and replacing with a Lok-On.

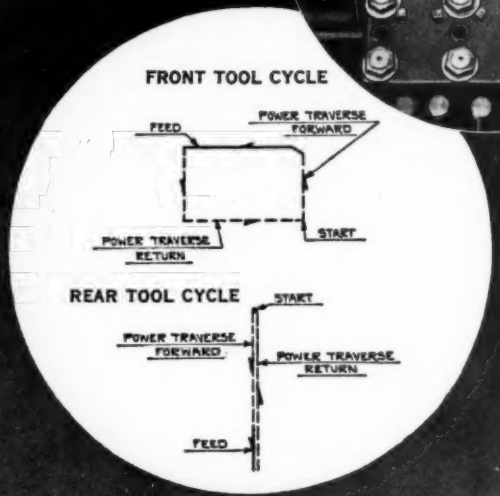
Barrett-Cravens PowerOx Truck Has Hand and Electric Lift

A combination hand and electric lift truck called the PowerOx has been introduced by Barrett-Cravens Co., 3255 W. 30th St., Chicago, Ill., to meet the needs of both the small and large industry. Loads are lifted by a series

Shift RESPONSIBILITY *to the* MACHINE

Once established to suit the requirements of a particular job, the No. 3A Duomatic automatically controls the diameter and lengths on each successive work piece. The length of forward traverse, the length of feed, pause at end of cut and the return traverse to stop position are quickly and easily established through simple mechanical adjustments. Any combination of turning or straight or angular facing can be obtained front or rear simultaneously or independently, without the use of special or extra attachments.

Write for descriptive Booklet No. 601.

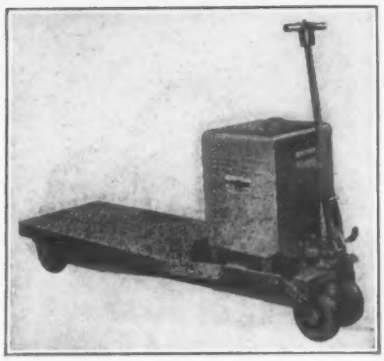


Proudly worn since March 6, 1942

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI, OHIO, U.S.A.

ENGINE TOOL ROOM AUTOMATIC LATHES

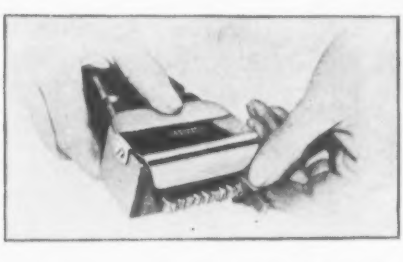


of vertical handle strokes. When the load is raised to the desired height, electric power is transmitted to the two rear drive wheels. The hands remain on the handles to lift the load and to propel the truck.

The frame is of heavy steel construction with rounded corners at the rear. Removable cover plates allow protection for the lifting mechanism and driving unit. Each wheel has independent motor drive. The truck has an average walking speed. This equipment is available in heights of 7, 9 and 11 in., lengths of 48 to 60 in., and widths of 19 and 25 in. Capacity is 4,000 lb.

Hercules Hand Marking Stamp Has a Thumb Pressure Clip

For marking multiple characters that change, Acromark Co., 7-13 Morrell St., Elizabeth, N. J., has announced a heavy-duty Hercules type holder. A holding clip allows the type to be changed by thumb pressure on the top

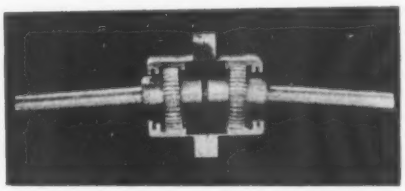


of the clip. Heavily built shoulder style type is used, and the holder is designed to center the striking force to give a uniform mark. Holders of a size too large for hand holding are furnished with an eye, so that a handle can be used, or with fullers on the sides to take heavy wire or rod handle for holding while striking.

Barcus Aligning Shaft Coupling Operates in Many Combinations

Barcus Engineering Co., 3931-35 Falls Road, Baltimore, Md., has announced a gear-type coupling for shafts in misalignment up to 6 deg. The unit comprises a cylindrical housing shell cut with internal gears having stub teeth with 20-deg. pressure angle. The shafts are connected to hubs of generated gears, each cut on a true central segment of a sphere, the surface of teeth being of constant width throughout their length. The external or hub gear is spherical on the periphery and at the root. The twin spheres of the hub gear cause it to ride on the pitch line at all times when engaged in the stub teeth of the housing gear, regardless of alignment.

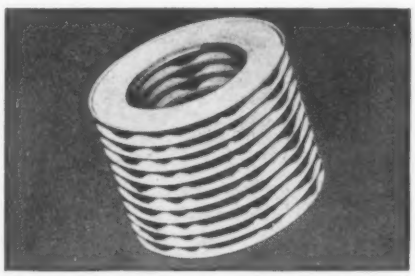
Misalignment up to 3 deg. on either



shaft is permitted because of the nature of the spherical gear. Six sizes of Barcus couplings, with maximum bores ranging from 1¼ up to 3⅞ in., are available.

Cook Spring Life Bellows Has Individual Diaphragms

A feature of the Spring Life metal bellows announced by Cook Electric Co., 2700 Southport Ave., Chicago, Ill., is its construction of individually fabricated diaphragms which are joined alternately at inside and outside peripheries. The bellows is made of silver plated



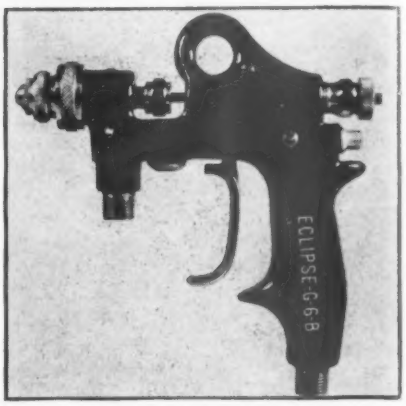
bronze and soldered with tin to prevent corrosion. Characteristics of the unit include uniform pressure movement ratio, sensitive low-pressure response and ability to return to the same no-load position.

Towmotor Produces Lift Truck With Crane Arm Attachment

Towmotor Company, 1226 East 152 St., Cleveland, Ohio, has announced a lift truck with a crane arm attachment which may be used either with or without forks. It is quickly demountable and interchangeable with standard forks so that the Towmotor on which it is used can be diverted to special handling purposes in a few minutes without interrupting the regular flow of materials.

Eclipse Paint Spray Gun Is Made With Plastic Body

A black plastic-body spray gun has been developed by Eclipse Air Brush



Co., 400 Park Ave., Newark, N. J., weighing a quarter of a pound less than the former gun with an aluminum body. The plastic is not affected by solvents, paint removers or thinners and is easy to clean. All fittings are made of metal.

NEW MATERIALS

Michigan Koilcote Coating Used in Rustproofing Systems

Koilcote, a protective coating material for use on heating coils in rustproofing systems, has been announced by Michigan Chrome and Chemical Co., 6340 E. Jefferson Ave., Detroit, Mich. It is said that with Koilcote it is not necessary to clean the coils more than once in five or six weeks. This coating is quickly applied, adheres firmly to the steel surface, and deposits which form on it are easily removed.

Asbeston Replaces Metal In Fittings for Aircraft

To replace critical metals in aircraft production the United States Rubber Co., Mechanical Goods Div., Rockefeller Center, New York, N. Y., has announced a line of fittings made from Asbeston, which is a woven asbestos fabric. They are designed in any shape or form required and made to withstand continuous heat of 350 F. or a temperature as low as —40 F. These fittings are said to have the advantages in sound-deadening and resistance to vibration. They can be joined to ducts or hose by cement, clamping by bands

to metal sleeves inserted in both openings, or by the use of quick-grip couplings.

Standard Soluble Cutting Oil Has Anti-Rust Properties

A heavy-duty soluble cutting oil has been introduced by Standard Oil Company of Indiana, 910 S. Michigan Ave., Chicago, Ill. It is said that this product contains an effective quantity of special compounding other than that required to give good emulsion characteristics. The oil mixes easily, possesses anti-rust properties, does not gum machine or work, is not susceptible to odor development, and is said to be non-injurious to the hands.

TRADE PUBLICATIONS

BEARINGS "A Guide to Better Bearing Lubrication," distributed by SKF Industries, Inc., Philadelphia, Pa., contains 32 pages filled with designs, formulas, and graphs which explain the highly technical text.

CEMENTED CARBIDE TOOLS A jumbo size wall poster which is illustrated in red and blue on white, and shows graphically four simple ways to get longer life from cemented carbide tools is offered by Vascoloy-Ramet Corp., North Chicago, Ill.

GEARS Red Ring Model GCL3 ultra precision fine pitch gear shaving machine is described and specifications given in a booklet prepared by the National Broach and Machine Co., 5600 St. Jean, Detroit, Mich.

GRINDERS The Dumore Co., Racine, Wis., has published a 36-page catalog designed to facilitate the rapid and efficient purchase of portable precision grinders. Each grinder is illustrated and principal dimensions are given in outline drawings.

GRINDING W. F. & John Barnes, Rockford, Ill., offers an 11-page booklet entitled "A Practical Guide for Grinding Rifle Drills" which contains descriptions, illustrations and drawings of four operations to be followed.

HOLDING DEVICES "Airgrip" pneumatic and hydraulic holding devices are illustrated and described in the catalog issued by Anker-Holth Mfg. Co., McCormick Bldg., Chicago, Ill.

INSPECTION DEVICES The portable Inspecto-Graph and the adjustable arm Inspecto-Scope are illustrated and described in Circular No. 20 prepared by S. Lowe & Sons Co., Fairfield, Conn.

LUBRICANTS Catalog No. 10 of the Pennzoil Co., Oil City, Pa., entitled "Production for Today, Protection for Tomorrow," outlines the uses of Penn-

Reporting on Current Steel Stocks

As you may know, the steel warehouse industry entered the war period with large and complete stocks. These reserve stocks of steel enabled industry to switch over quickly from peace to war production. However, in the process, stocks of steel in the warehouses of the country became seriously depleted. In fact, these great sources of emergency steel became almost non-existent.

No matter how carefully plants are maintained and production programs scheduled, there are always times, particularly under our heavy war load, that certain lots of steel must be secured immediately or production is imperiled. So companies working at top speed and embarrassed by their inability to secure steel quickly from warehouses, began reporting their problems. The War Production Board was quick to grasp the situation and assign special allotments to the warehouses. A bad situation is now gradually being improved and we are glad to report that our stocks are somewhat better assorted.

In order to eliminate the time required for many roll changes and so to permit increased overall production of steel, we are concentrating on the most generally used sizes. In spite of this curtailment of our usually very broad range of sizes we are now better able to serve than at any time in recent months.

When you need steel or have a problem of selection or fabrication, get in touch with your nearest Ryerson Steel-Service Plant. Our engineers and metallurgists will be glad to work with you. Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

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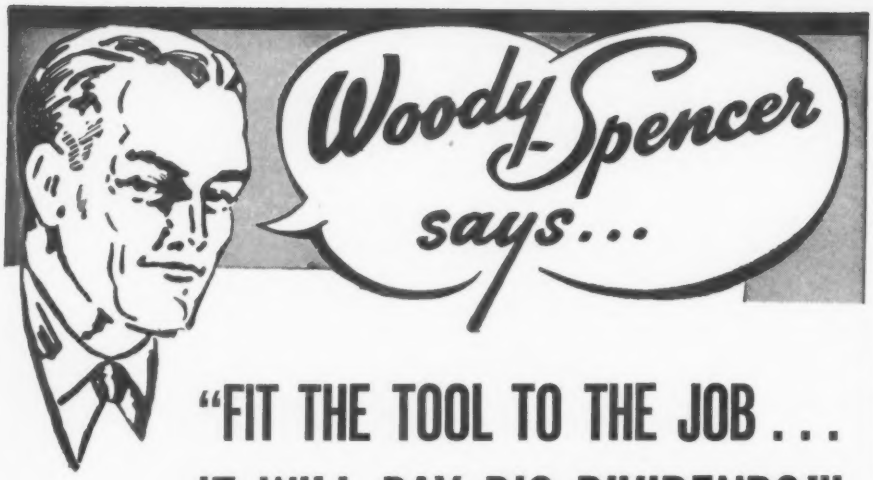
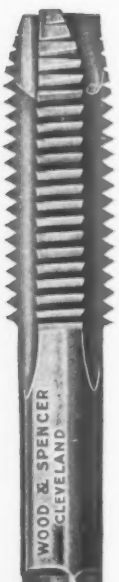


"FIT THE TOOL TO THE JOB . . . IT WILL PAY BIG DIVIDENDS!"

The wrong tool can easily spoil a job . . . result in loss of time, material and labor. Therefore, choose the tool best suited to each job. By so doing you will be able to produce quality work, faster, and with less waste . . . thus contributing greatly to Our Country's War Effort. Write for helpful information. From customers blueprints we quite frequently make recommendations for



"THE RIGHT TAP AT THE RIGHT TIME"

The Wood & Spencer Company
Cleveland, Ohio

bell oil. Catalog No. 11 gives the four main points to consider when selecting bearing lubricants to minimize friction and wear.

MACHINERY STEELS The Crucible Steel Co. of America, 405 Lexington Ave., New York, N. Y., has issued a folder of handy data and stock information on Max-El machinery steels 1-B, 2-B, 3, 3½ and 4.

MICARTA A 36-page data book to provide manufacturers of war equipment with design and selection data on the application of Micarta is announced by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

MILLING MACHINE A 4-page bulletin published by Linley Bros. Co., Bridgeport, Conn., describes and illustrates the high speed vertical milling and jig boring machine.

PLASTICS The 864-page 1943 Plastics Catalog published by the Department of Public Relations, Modern Plastics Magazine, 122 East 42 St., New York, N. Y., contains more than 100 articles of authoritative information on all phases of plastics. There are sections on plastics in war, synthetic rubbers, history of plastics and plastics materials manufacture. An index and directory are included.

PNEUMATIC TOOLS "Cleco Cartoons" is the title of a handbook on the care of pneumatic tools, offered by The Cleveland Pneumatic Tool Co., 3781 East 77 St., Cleveland, Ohio.

PORTABLE MACHINES Junior Catalog No. 1-F, issued by the R. G. Haskins Co., 615 S. California Ave., Chicago, Ill., illustrates and describes portable flexible shaft machines.

POWER TRANSMISSION In addition to complete descriptions, diagrams, dimensions and prices of thousands of power transmission appliances the 388-page wartime annual released by Dodge Mfg. Corp., Mishawaka, Ind., contains engineering data essential to proper design, installation and operation of mechanical power drives.

RECORDERS Micromax frequency recorders and indicators are described in a 20-page catalog, N-57-161, issued by Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia, Pa.

SCREWDRIVERS Leaflets on Models A and B power screwdrivers and on three sizes of motorized hopper units are available from Detroit Power Screwdriver Co., 2801 W. Fort St., Detroit, Mich.

STROBOSCOPE A 25-page booklet entitled "Eyes for Industry—Stroboscopic Techniques," prepared by General Radio Co., 30 State St., Cambridge A, Mass., contains chapters on types of Stroboscopes, qualitative measurements, typical uses, operating hints and techniques, photography and specifications.

TAPPER Features of the clutch type automatic reverse tapping attachments are covered in an illustrated folder available from the Dorman Machine Tool Works, 357 Canal St., New York, N. Y.

TAPS The 134-page catalog, No. 22, issued by Detroit Tap and Tool Co., Butler St., Detroit, Mich., gives specifications and prices of standard and special taps, thread milling cutters, and other forms of threading tools and thread gages and contains numerous reference tables.

TRAINING A brief description of motion picture films, instruction books, bulletins, wall charts and blueprints on lathe operation will be found in the 4-page circular, No. 21-C, published by South Bend Lathe Works, South Bend, Ind.

WELDING The features of positive arc welding are outlined in a leaflet prepared by the Welding Apparatus Co., 2750 W. Van Buren St., Chicago, Ill.

WELDING Castolin Eutectic low temperature welding rods are described in a 4-page folder distributed by Eutectic Welding Alloys, Inc., 40 Worth St., New York, N. Y.

NEW BOOKS

TOOL DESIGN—*By Cyril Donaldson and George H. LeCain, Rochester Athenæum and Mechanics Institute.* 443 *pages. Rochester Technical Series. Published by Harper & Brothers, New York and London.* $3.75.

General methods of tool design, which enable the student to develop ideas into practical specifications for modern manufacturing methods, form the basis for this volume. The contents, which are aimed primarily at persons preparing to be tool engineers, include preliminary sections on the place of the tool engineer in the plant, on drafting room practice, manufacturing processes, properties of materials, and tolerances and allowances. The bulk of the subject matter covers springs, welding, cutting tools, punch and die design, gages and gage design, jigs and fixtures, automatic screw machines, and turret lathes.

The book is designed for students at a technical school level, but for a book at such a level, the contents of individual chapters are extensive. The chapter on manufacturing processes, for example, treats sand and die casting and casting design, plastic molding and the design of plastics, hand and automatic punch presses, metal-working, welding, forging, rolling, drawing, extruding, broaching, drilling, grinding, honing, lapping, centerless grinding, buffing, galvanizing, electroplating, common and special finishes and cleaning. Enough is said of each of these

SAY! YOU, UP THERE on the PRODUCTION FRONTS

No more holding up the steady flow of vital war needs because you're waiting for grinding wheels.

WE'RE RIGHT BEHIND YOU

Can make prompt deliveries on all Mounted Points and Grinding Wheels 3" in diameter and under. We've stopped making the larger sizes for the duration, so we can fill orders quickly for these important smaller sizes.

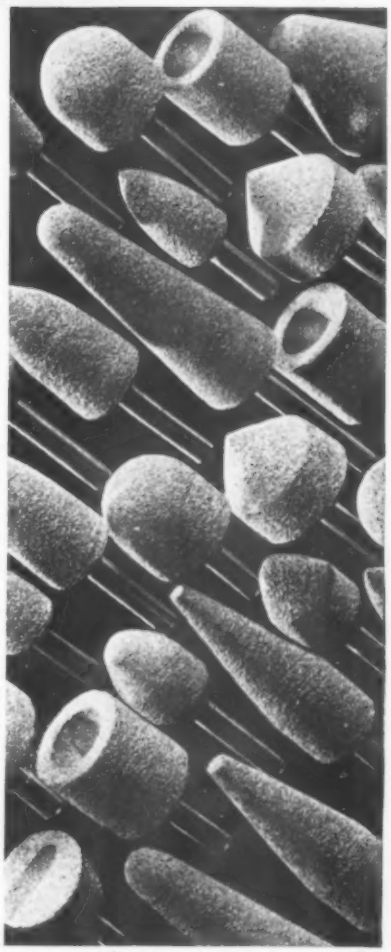
IT'S OUR WAR-TIME JOB

With the approval and endorsement of WPB, all our facilities are concentrated on turning out large quantities of wheels 3" in diameter and under. We're at it 24 hours a day, and keeping up with orders. Our central location is an advantage and means no time is lost between our production line and yours.

TRY ONE FREE

Tell us the kind of job, type grinder you use and size wheel you'd like for your test, and we'll send one free postpaid.

NEW CATALOG—shows mounted wheels in actual colors and sizes, portable electric tools and time-saving accessories for grinding, burring and polishing.



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STANDARD DEGREES
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W —OR "WORKING SETS"
"W" accuracy is a guaranteed tolerance of ± .000008 inch per inch or fraction thereof, of gage.
I —OR "INSPECTION SETS"
"I" accuracy is a guaranteed tolerance of ± .000004 inch per inch or fraction thereof, of gage.
L —OR "LABORATORY SETS"
"L" accuracy is a guaranteed tolerance of ± .000002 inch per inch or fraction thereof, of gage.

processes to give the student a clear idea of the work and the design problems involved in it. Other chapters are as fully presented.

There are 463 numbered line and halftone illustrations so that all points are fully and clearly pictured. At appropriate places in the book, tables of material properties, cutting speeds, tool and part sizes, standard dimensions and gaging limits are printed.

A variety of teaching materials is given at the end of each chapter, including questions on the text, mathematical problems, design and drawing problems. Illustrative problems are included in the text where necessary.

•

GRINDING WHEELS AND THEIR USES—*By Johnson Heywood, under the auspices of the Grinding Wheel Manufacturers Association. Second Edition. 436 pages. Published by the Penton Publishing Co., Cleveland, Ohio.* $3.

The second edition of this standard handbook of grinding wheels replaces the original edition published in 1938. In this edition more stress has been laid on typical ingenious tricks for solving difficult grinding problems, and on designing parts to permit their being ground instead of machined by other methods. It contains much new material, including additional chapters on disk, thread, and gear grinding, grinding dies and molds, lapping, honing, superfinishing and preparing metallographic specimens. New appendix material includes a table of wheel recommendations, lapping compound recommendations and standard grinding wheel markings. Where older methods have been improved the old descriptions have been dropped and accounts of the new methods substituted. To illustrate the new material, 85 figures have been added.

•

WARTIME SUPERVISION OF WORKERS—*By Richard S. Schultz, director, Methods for Industrial Relations, Inc., consulting editor, "Supervision." 206 pages. Published by Harper & Brothers, New York and London.* $2.25.

To meet the demand for more and more supervisory employees in our expanding wartime industries, this new book offers some practical methods for the discovery and development of foremen and supervisors. The general problem is presented in the first three short chapters which touch on the changes that have come in supervision methods, the ways of passing on the "know how," and the qualifications of a good supervisor.

These first chapters serve as an introduction to the bulk of the book which is based on what the author calls, "One Hundred Standard Statements on Human Factors in Production Supervision." These statements are commonly held beliefs about super-

vision problems. They are listed in order in the appendix, but are presented in the text body under such heads as "Building Morale," "Fitting the Worker to the Job," "Avoiding Accidents," "Increasing Production by Better Work Habits," "Using the Interests and Energies of Workers for Production," and "Training Workers." Under each head the statements are offered in "true or false" fashion, and are followed by a discussion of the statements in the light of the answers made by a number of successful supervisors and executives.

Besides the "Standard Statements," considerable other statistical data is given in the appendix, including answers to the statements and a rating chart based on the number of right or wrong answers. A survey of personal information on supervisory personnel, based on 216 men and including such details as age, birthplace, education, whether they ever repeated subjects in school, years of marriage, whether their names are in the telephone directory, savings, hobbies, membership in military organizations, accidents or injuries suffered, sales experience, etc., is also included. The book ends with a selected, chapter-by-chapter bibliography.

•

THE NATIONAL PAINT DICTIONARY—*By Jeffrey R. Stewart, editor, The National Paint Bulletin. 224 pages. Published by the Stewart Research Laboratory, 1340 New York Avenue, N.W., Washington, D. C.* $7.50.

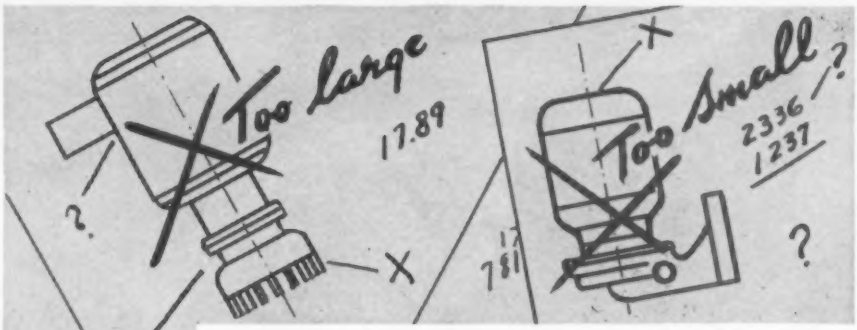
Paint and the raw materials that go into their manufacture are defined in this volume. As editor of the National Paint Bulletin, the author has compiled this information through his familiarity with the industry and through consultation with technicians in the field.

A supplement contains a selection of tables and other data related to paints and allied materials. This section also includes advertising matter.

•

FUNDAMENTAL SHOP TRAINING FOR THOSE PREPARING FOR WAR SERVICE—*By John T. Shuman, coordinator, Williamsport Technical Institute, Capt. Bailey Wright, Private Flying Division, Civil Aeronautics Administration, James Ritchey, formerly instructor in woodworking, Illinois Institute of Technology, and a staff of technical experts. 327 pages. Published by American Technical Society, Chicago, Ill.* $2.

This book is one of the volumes in the publishers' Preinduction Training Series. As such it is designed to help train part of the 63 out of every 100 selectees in our mechanized army who are assigned to specialized tasks. The book starts from scratch with the non-technical man. The first sections identify common hand tools and introduce



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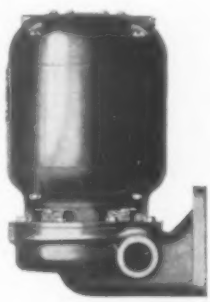

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such simple bench operations as chipping, filing, scraping and tapping.

A section on measurement, including micrometer and vernier tools, precedes the introduction of drilling and lathe techniques. These are the only metal machining processes discussed. The remainder of the book presents the bases of other required trades, containing chapters on airplane construction, cable splicing, electrical wiring and splicing, woodworking, painting, and rope, splices and knots.

The material is presented in very simple form so that it may be used by the individual as well as in the classroom. A number of handy rules and tables are included at the end, among them tables of drill and screw sizes, Morse tapers, and board measure.

Men Must Fight, Women Work

BY ALBERT GRAY

A survey made by the United States Employment Service in the spring of 1941, of 1,800 occupations in 21 key war industries, showed approximately 80 percent of war industry jobs adapted to women workers and 8½ percent of these jobs filled by women.

Estimates of the War Manpower Commission are an available working force in this country, including the men in the armed forces, of 63,200,000 by the end of 1943; 9,700,000 will be in the armed forces; 20,000,000 in war industries; 19,600,000 in civilian industries and 7,900,000 in year 'round agriculture, besides "additional millions" for planting, harvesting and seasonable work.

The proportion of women industrial workers has steadily increased during the last half century. According to the 1890 Census, 4,000,000, 17 percent of the total employment were women. That proportion has consistently grown. By the Census of Manufactures, 25 percent of all employees in 1939 were women.

Since 1939 and the outbreak of the war in Europe, and the abnormal growth in war material production in this country, the increase of women industrial workers has taken on astonishing proportions. A rough average of the proportion of women industrial workers in 1941 was 17½ percent. That increased to 30 percent for 1942, and a further growth to 51½ percent is anticipated for 1943. In machine shops where no women were employed in 1941, 10 percent of the employees were women in 1942 and an estimated 50 percent will be in 1943. In foundries 5 percent were women workers in 1941 with 18 percent estimated for 1943. The average in manufacturing plants in 1941 was 10 percent; in 1942, 17 percent and the estimate for 1943, is 35 percent. Aircraft and aviation plants registered the most striking increases, of 5 percent to 80 percent in the former and 1 percent to 65 percent in the latter.

According to unofficial estimates of the Bureau of Labor Statistics for the last quarter of 1941, 54,000 women at that time were employed in the manufacture of machinery; 46,000 in the iron and steel industries; an approximate half million in defense industries, with an estimated 6,000,000 by the end of 1943.

Mary Anderson, Director of the Women's Bureau, Department of Labor, states that women excel in work demanding care and continued alertness with the employment of good eyesight, as in the use of gages and micrometers. In tasks demanding dexterity and speed, best results with women operatives are secured by allowing workers to assume a sitting position and determine their own tempo of work speed.

On the limitation side Miss Anderson names three restrictions: women average about one-half a man's lifting strength and two thirds of the pulling strength; they lack the basic mechanical knowledge requisite in handling tools and are susceptible to certain health hazards in the presence of specific chemicals to which men workers are more immune.

The industrial manpower road of this country is the one frankly outlined by the British Government in the issuance of its first Registration for Employment Order of March, 1942: "Nothing that a woman can do or can learn to do, however, important, should be allowed to absorb a man of military age."

Inspection and Common Sense

By FRANK C. HUDSON

Inspection is a peculiar part of manufacturing. It is as changeable as a chameleon and it can help production immensely or block it completely, according to the methods used and the individuals who do the job.

In the old shops where men built the entire machine and no two were ever exactly alike, we made the second piece to fit the first, and all was serene. But when we began to split the work, or when we tried to send out replacement parts, this plan didn't work so well. Then we began to do a little inspecting of pieces as they were made. We began to throw out our chests and talk about "interchangeability." We've credited this to Eli Whitney and others who had some sort of a vision, but who never heard of tolerances or Class 3 fits. By present-day standards, their "interchangeability" was a bit wobbly in its application.

Some of the old shops, where the work was divided into many operations, tried to make each man the inspector for the previous operation. If work came to him that was not O.K., he was supposed to refuse to accept it. If he took a shaft that had the collars wrongly spaced, and did his job, such as threading the end, he didn't get paid for his work, when the assem-

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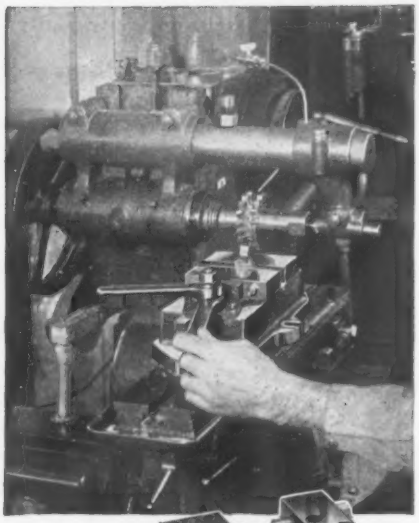

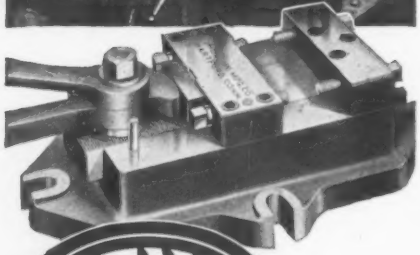

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bler found he couldn't use the shaft. This made every man a watch dog on the fellow who came before him. It sounded like a cheap way of getting inspection done, but the practice didn't prove good enough to stick.

Then came the elaborate inspection room (or "viewing room" as our British friends call it) into which all parts were trucked before going to stores, from which they fed to the assembly department. This inspection room was a sort of graveyard where production schedules were often knocked into a cocked hat. Inspection of this kind is a post mortem that tells you why the pieces are useless but doesn't help the production of finished machines. It may or may not prevent the same mistake next time but the parts you needed for assembly are in the scrap pile. Inspection of this kind has largely gone by the board.

Parts made on automatic or semi-automatic machines are checked in various ways. Correct tool setting is tested, usually by an inspector, before the machine starts its run. After that pieces are checked occasionally, at intervals dictated by experience in tool wear. Sometimes the operator checks occasional pieces. In other cases a floor inspector makes periodical inspections as he goes from one machine to another.

On some classes of work the fixtures act as gages and detect errors in previous operations by refusing to accept oversize work, undersize parts usually requiring different detection. Where tolerances are very close, there may be more inspectors than machine operators as in some departments of anti-friction bearing shops.

After we began to use "go" and "no go" gages, we had the idea that when the inspector's gages wore a little they were good enough for the shop. This got us into plenty of hot water. The inspector would reject work that was O.K. by the shop man's gages. So we reversed the process and now the inspector's gages have the greatest tolerances—all that can be safely allowed and have the parts work as they should.

But that isn't the whole answer either. In shops with many inspectors it is customary to have the "rejects" re-inspected by inspectors who can exercise good judgment as well as handle gages. These top inspectors are supposed to know enough about the product and its uses to stretch tolerances in certain dimensions, when they know it will not affect the satisfactory performance of the machine. This super-inspection is sometimes called the salvage inspection.

One grand opportunity for headaches in final assembly occurs when subassemblies fail to match up with the main structure. Under various names, we have developed the very necessary inspection of units before they join the final assembly lines. These units must be tested or inspected from two distinct angles. First to know that they do their stuff, and next that they fit the place into which they are supposed to go. Unless they do, the final assembly line gets into difficulties, production schedules are upset, shop space becomes overcrowded and planes do not come off the line as our boys in action have a right to expect.

But even proper inspection processes are useless however unless they have something to inspect. Unless production is controlled so that the wings, oleos and turrets are ready when needed, we might as well all go fishing. Unless all departments tie in together, our boys don't get planes.

Too many inspectors do not realize how much they can delay production by quibbling over details that do not affect the satisfactory working of the machine. True they are often tied by specifications that should never have been written. But the inspector with long experience can usually convince the higher ups to overlook some of the foolish things the specifications call for which have no effect on the working of the unit.

The writer recalls an interesting case that happened during the last war, in the test room of the famous OX-5 Curtiss engine at Hammondsport. One engine in particular was pulling more than average load on the brake dynamometer. A foreign inspector wanted the engine for his order. Chief tester said it couldn't be done, belonged to some one else. After the inspector left I got the real reason. "If," said the tester, "I gave him that engine he'd lose his job when it came to the first overhaul. Darn near every part has his 'reject' stamp on it!"

Inspection has but one legitimate function—to pass as many pieces that will work satisfactorily in the finished machine as possible. Any inspection system that accomplishes this is a success. Any system that fails to do this no matter how scientific or "foolproof" it is supposed to be, should go in the discard.

In too many cases the question of inspection leads to a clash of personalities, which assume unwarranted proportions. Where production is urgently needed, as in the case of planes, nothing of this kind should be permitted. Any deviation from standard practice that will save delay without being at all detrimental to the product should be permitted occasionally as the need arises. No prestige or personal pride should stand in the way of getting out the maximum number of planes.

Manufacturers are to be credited with a desire to maintain the high quality of their product. But a slight modification in their usual standard that will not affect operation or reliability, yet will increase production, should not keep our armed forces from having all we can send them. The excuse of not wanting to have their name on any product that is below their standard in appearance, hardly holds water in war. Lives of our men are of more value than any reputation that may be involved.

HELP in solving the "MANPOWER" problem

Whatever increases the productivity of the manpower which industry *now has* reduces the problem of obtaining more manpower.

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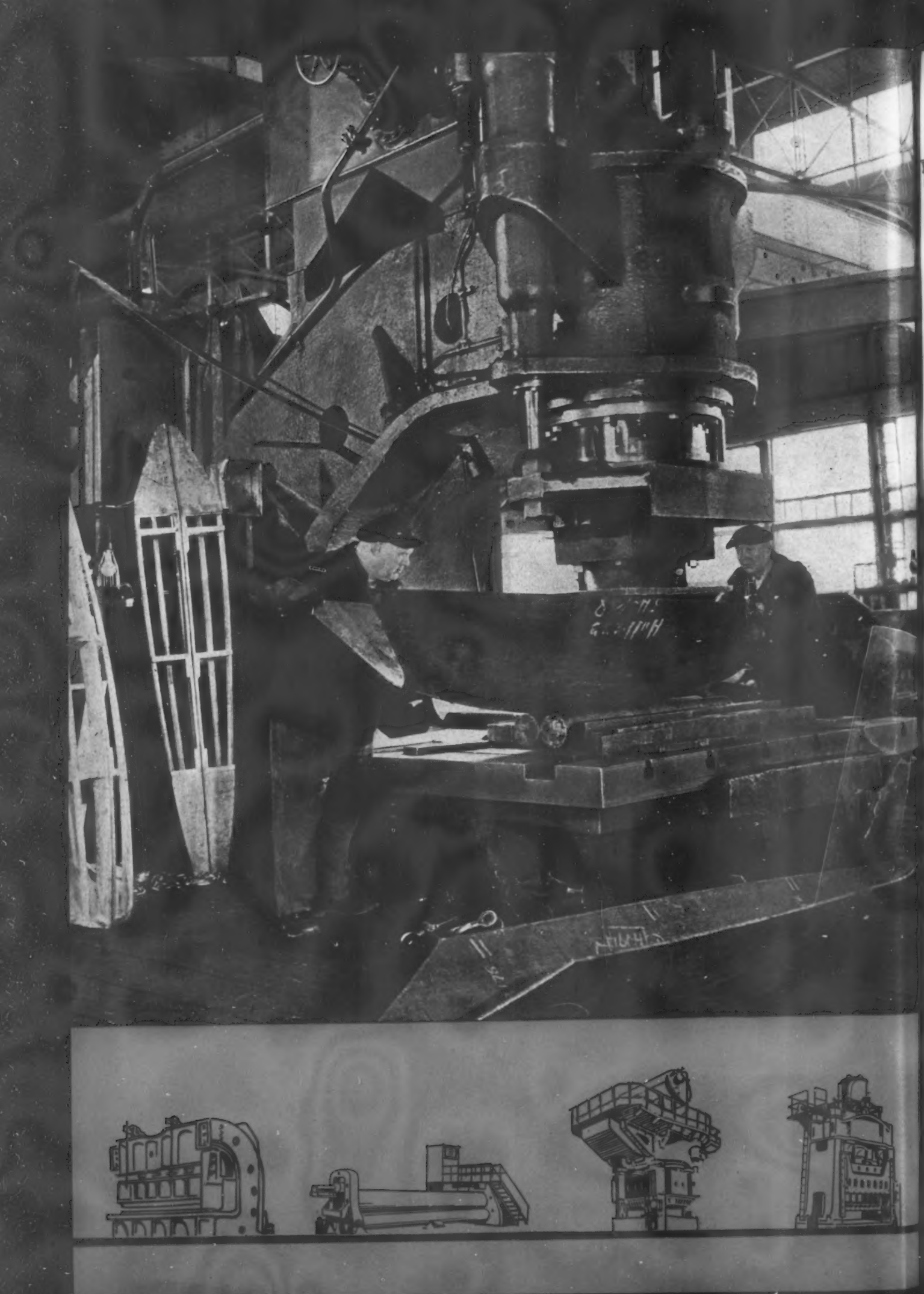

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were at Casablanca

THE interesting thing about this Casablanca business is the terrific wallop our country is packing in international affairs these days.

We've been on the muscle just a little more than a year, now, but the boys who came up through the prelims are already calling us "Champ" . . . and it looks as though the other corner of the ring is beginning to dread the finals.

▶ How come? It wasn't so long ago that Brenner Pass and Berlin meetings were dominating the world's headlines.

YOU made the difference. "You" meaning every American who worked hard last year in America's war industries. Because a statesman, or a general, can only be as good as the industrial strength he represents.

▶ By the very act of shunting America's mighty industries from making peacetime things like automobiles and streamlined trains to making wartime things like ships, bombers and guns, the voices of your representatives were magnified from whispers to thunder in the councils of war.

YOU were at Casablanca (*Cont'd*)

If that makes you feel pretty proud, as a part of the industrial system that is going to burn the bearings of the Axis, maybe you'd better think about what is going to happen to our industry (and, incidentally, to your job) after the war is over.

▶ Things could get in a terrible mess, you know. We'll have the biggest debt in the history of the world, and 10 million soldiers and sailors to find jobs for.

The only thing that will save us will be the last thing most folks will think of—making it easy for business to grow.

If business grows, jobs grow.

Good business is the source of all good living.

America invented the method that produces better living. Here it is:

1. Constantly improve the equipment available for the worker.
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   (a) Lower prices to consumers.
   (b) Improve the standard of living.
   (c) Provide incentives for invention, leadership and investment.
   (d) Lay aside "Seed Money" that can be used to start over again at item 1.

That's all there is to it. That's what gave us the highest living standard on earth. It can take up the job after the war, taking care of you, the soldiers, the sailors, and the war debt—IF it is allowed to operate.

But there are hundreds of laws that gum the works. Both business and labor need laws, the same as any other humans, but they need laws that will *lubricate* the industrial machine.

Let's take two of the gummy ones: There's a law that says a business must take 20 years to charge off a machine. Look what that does to item 2 in our "recipe for good living." Most machines are obsolete in 5 years, and government should encourage scrapping them. Obsolete machines *prevent* lower costs and *keep* wages down.

Another law, the excess profit tax, confuses business profit ("Seed Money") with private profit. In preventing a crop of war millionaires, this law also takes away most of the "Seed Money" that business should be saving for the big expense of converting back to peacetime work.

That law ought to be changed. If you think so, too, ask your congressman to study all laws with this principle in mind:

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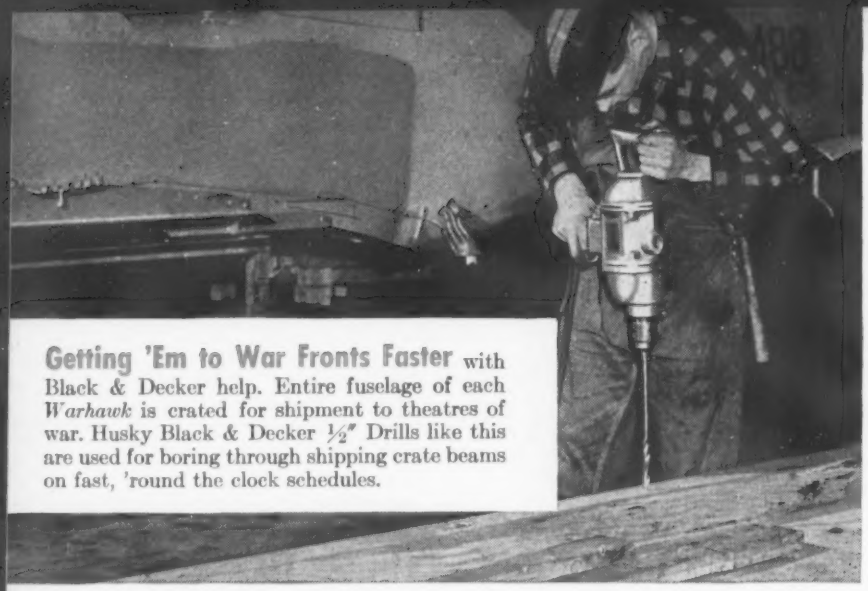
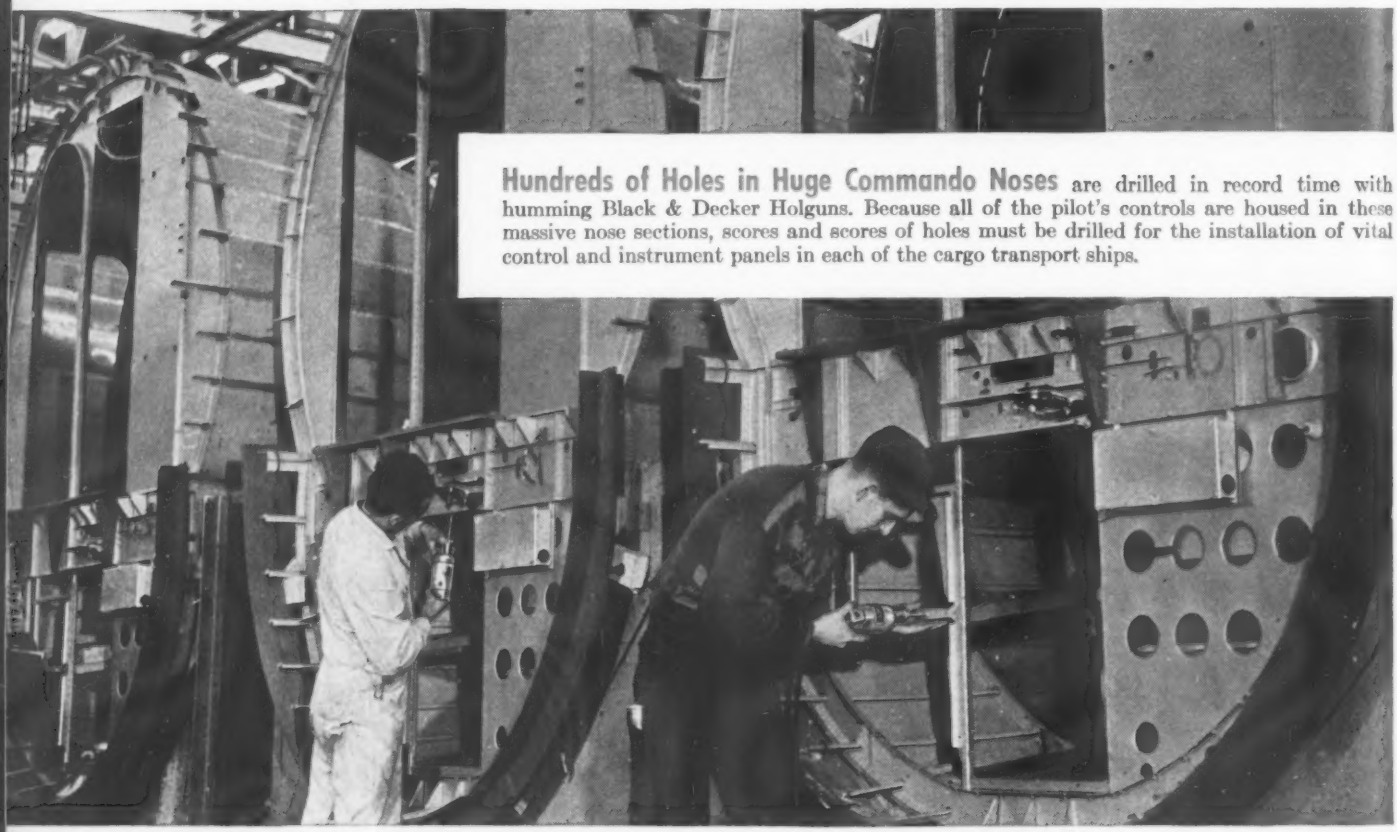


Getting 'Em to War Fronts Faster with Black & Decker help. Entire fuselage of each *Warhawk* is crated for shipment to theatres of war. Husky Black & Decker ½" Drills like this are used for boring through shipping crate beams on fast, 'round the clock schedules.

Using ¼" Drill in Special Radial Arm for accurate drilling of bulkhead assembly part with template. After completing this operation, the operator uses the Holguns (shown on rack) for drilling many other holes manually.



Hundreds of Holes in Huge Commando Noses are drilled in record time with humming Black & Decker Holguns. Because all of the pilot's controls are housed in these massive nose sections, scores and scores of holes must be drilled for the installation of vital control and instrument panels in each of the cargo transport ships.

Women Team Up at B & D Bench Grinder to keep the planes rolling. Operator at left is brushing ¾" aluminum angles, operator on right is wire-brushing small aluminum rods to remove burrs. A battery of these 10" Bench Grinders keeps critical war material flowing.

Holgun at Work on Wing Fillets on the final assembly line for *Warhawks*. After this drilling operation, each Curtiss-Wright fighter plane is ready for final inspection and actual flying tests.

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Hurrying Giant "Commandos" to take 'em There!

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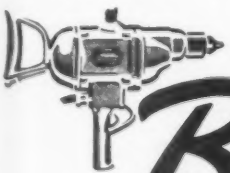

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From Nose to Tail-Wheel of giant *Commandos*, thousands of holes need to be drilled on fastest schedules possible. Here operator is drilling with Holgun to install a tail-wheel mud guard on one of the huge "flying boxcars."

Wing Panel Tapping Goes Faster with this Black & Decker Tapgun. The operator has attached an accessory to Tapgun which automatically assures uniform depth of tapping. Tapguns save time, labor on many vital operations.

Curtiss-Wright Production Lines are Alive with the aircraft industry's most used electric drill . . . Black & Decker's famous "Handful of Power" Holgun. Hundreds of them are used to drill wing sections (shown here) of deadly *Warhawks*.

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T-103 Stationary Hydraulic High Pressure Tube Tester—primarily designed for testing flexible tubing but also used for checking short sections of plain metal tubing . . . as many sections as required may be tested at a time . . . the Hydraulic Pump is capable of a 1000 lb. per square inch pressure that may be built up to a 10,000 lb. per square inch pressure by means of a built-in intensifier.

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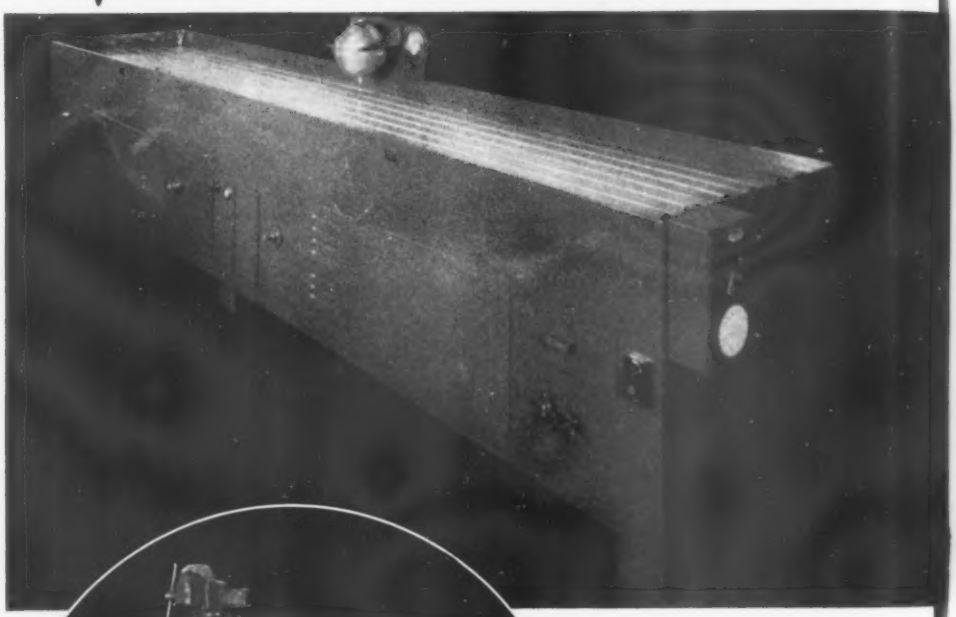

T-102 Principally used for checking aircraft tubing this stationary Hydraulic Test Bench with a variable test pressure ranging from 0 up to 10,000 lbs. per square inch and a variable delivery pumping unit 0-12 gal. per minute—is used to test anything in the line of hydraulic equipment before its assembly into aircraft.

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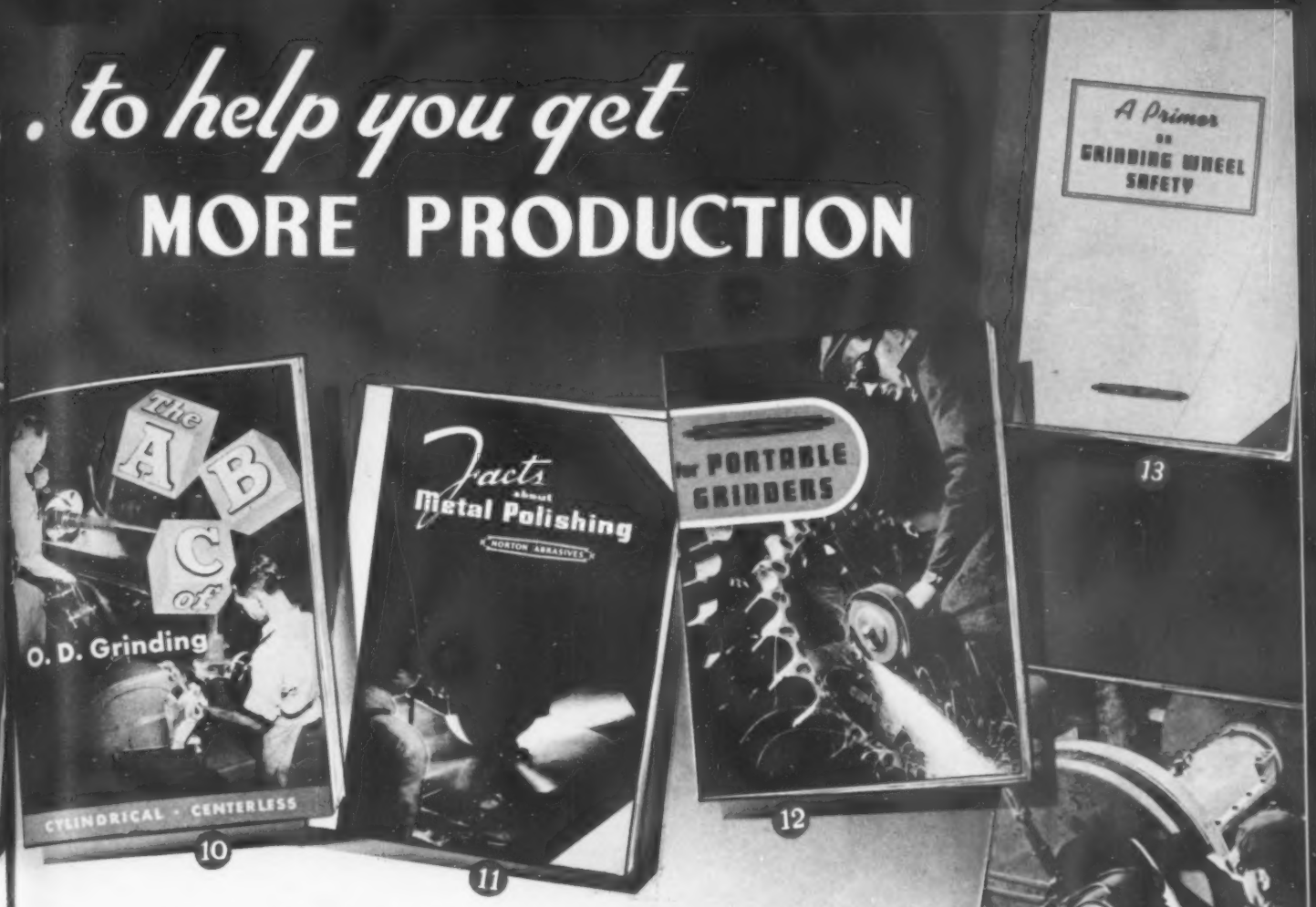

6. ABRASIVES AND GRINDING WHEELS. Defines in an understandable way the two major types of grinding, the three physical characteristics of every grinding wheel, the two artificial abrasives used in the production of Norton wheels, the five general types of bonds; a guide to selection of abrasives, grain size, strength of bond, structure, and grinding wheel markings. 82 pp.

7. A HANDBOOK ON TOOL ROOM GRINDING. This handbook receives a ready welcome in tool rooms everywhere. It is a guide for the tool room operator or apprentice prepared by Norton engineers in co-operation with several tool and grinding machine manufacturers. It contains a wealth of information of great importance in these times when every tool room must operate at the highest point of efficiency possible. 177 pp.

8. NORTON GRINDING WHEELS FOR THE TOOL ROOM. A condensed summary of some of the most popular sizes and shapes of wheels in the grains and grades commonly used for tool grinding. 9 pp.

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10. THE A B C OF O. D. GRINDING. "O. D." is the common shop expression for the outside diameter of a cylindrically shaped piece or part. This booklet covers the principal elements of cylindrical and centerless grinding, including information on both types of machines and their operation. There is a complete chapter each on the selection of wheels for cylindrical and centerless grinding. 40pp.

11. FACTS ABOUT METAL POLISHING — A booklet that contains 39 pages of helpful information on the selection and use of abrasive grain for polishing. Typical chapter subjects are "Preparation of Glue", "Types of Polishing Wheels", "Setting Up Polishing Wheels", "Setting Up Abrasive Belts", "Correct Drying", "Factors of Efficient Polishing".

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NORTON ABRASIVES

SAFE WAYS IN WAR PRODUCTION

NEW WORKER—Every new employee in a Bethlehem Plant wears this button. It helps to fix his attention on safety. It signals to more experienced employees that he is new to the plant, and they keep an eye on him, and do not hesitate to offer friendly guidance in case he forgets instructions and unknowingly breaks any safety regulation.

Industrial accidents, bad enough because of the human distress they cause, are also a grievous drag on production. Every day that injury lays up a worker means lowered output of the materials our armed forces are asking for.

Safety engineers know they must be more than ever on guard as pressure for production intensifies and men work against time. When war came, Bethlehem Steel Company expanded its accident-prevention program to meet the new conditions. Special efforts were addressed to the new employee to make him safety-conscious from the moment he walked into the plant. And by posters, group meetings and individual instruction, the safe way of doing his job was ground into the subconscious of new Bethlehem employee and veteran alike.

Significant are the results of a current study, showing that of all disabling accidents to Bethlehem employees less than one-third occur in the course of their work. Even with employment rolls upped by the tens of thousands and plant operations at top speed to meet the demands of the war program, the Bethlehem employee is safest, best protected against injury, during the hours he spends on the job.

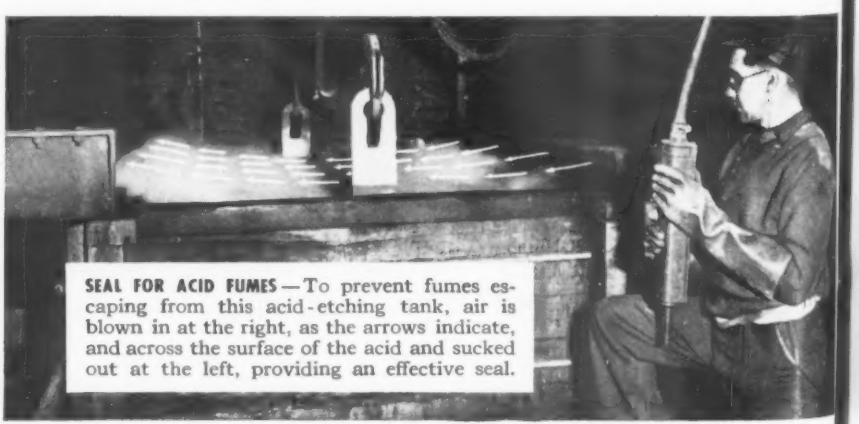
AUTOMATIC HAND GUARD—This man is operating a trimming press. If he should absent-mindedly let his hands move too near the danger zone, the two cables will automatically whisk them back to safety, before the ram of the press descends.

100% HEAT-INSULATED—Asbestos-covered hood, chrome-leather full-length apron, chrome-leather gloves, chrome-leather full-length sleeves and asbestos guard on torch handle give this worker complete protection against heat and flying sparks.

EYES DOUBLY GUARDED—Even though this grinder is equipped with a heavy glass shield, the eyes of the man who is operating it are given further protection against sparks or flying bits of abrasive by the cup goggles that he is wearing.

BETHLEHEM STEEL

Bethlehem Steel Company is actively supporting the National Safety Council in its campaign against accidents in war production, through the War Production Fund to Conserve Manpower.



SEAL FOR ACID FUMES—To prevent fumes escaping from this acid-etching tank, air is blown in at the right, as the arrows indicate, and across the surface of the acid and sucked out at the left, providing an effective seal.

"It Takes a Tool that's Precision Built to Do Precision Work"

Just as water never rises higher than its source, so is the accuracy of your tool and die work limited by the accuracy of the tools, machines, and instruments you use. This is most important in your grinders, because grinding governs the most critical dimensions. Working to tolerances of one ten-thousandth is every-day practice with Dumore precision grinders, because these grinders are themselves built by craftsmen who work and think and talk in terms of a tenth. Equally important and equally accurate is the control of all inertia forces by dynamic balancing of supreme sensitivity — not by assemblies, but piece by piece and part by part. See for yourself the secrets of Dumore precision in the drawing below.

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1. MOTOR HOUSINGS are compact and sturdy . . . designed for easy portability.

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3. PULLEYS are balanced to increase belt life and give full power transmission.

4. ENDLESS DRIVE-BELTS, carefully selected for smoothness, are another aid to accuracy.

5. DYNAMIC BALANCING OF armatures and rotating parts does the utmost to prevent vibration and increase precision.

6. PRE-EXPANDING armature windings, then double-dipping in enamel and baking them, prevents centrifugal "breathing."

7. LEAD WIRES are swaged to commutators by special Dumore process to assure 100% electrical contact permanently.

8. "FOG-OF-OIL" LUBRICATION to the quill bearings. A felt tube within the quill, extending to tapered ends of the main spindle, is held in place by a metal liner. Felt fingers at each end of the felt tube ride on the spindle surface, which is tapered to form an oil slinger. As the spindle revolves, it picks up a minute amount of oil from these fingers and the taper carries the oil along the spindle to the top, where it is thrown into the bearings in a fog. (Pat. No. 1,859,068.)

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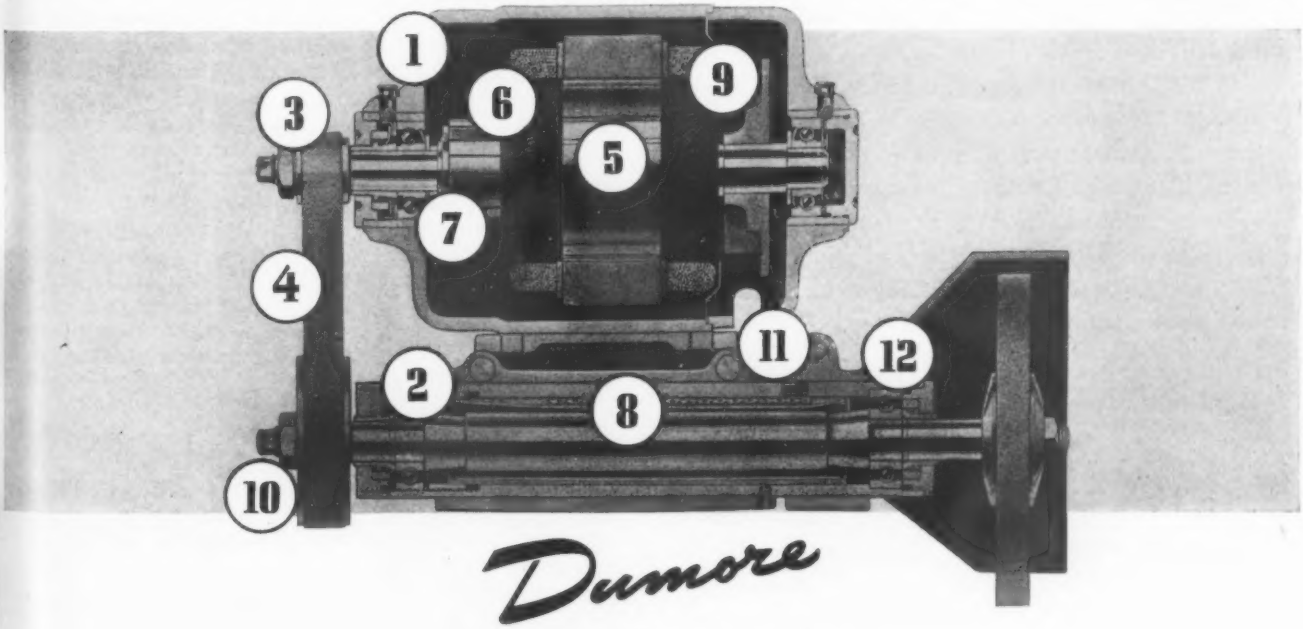
12. BALL BEARINGS are selected with infinite care for countless hours of vibrationless running.



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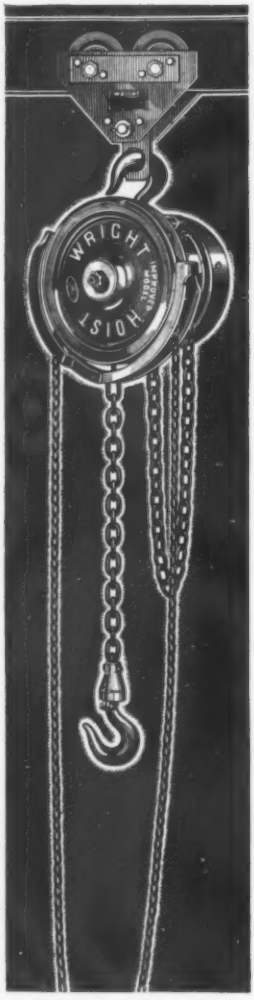

In these days of shortages we don't need to know how to choose a new hoist—but how to use an old one more efficiently, and how to make it last longer.

So—get busy with the grease gun! Where properly lubricated and maintained, many **WRIGHT HOISTS** have given constant, trouble-free service for 20 and 25 years. We have known other hoists to be so badly abused they were ruined in two years. Your **WRIGHT HOIST** will last indefinitely if you treat it right.

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Conserve steel and maintain production schedules by regular inspection and lubrication.

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Save Manpower, too

The U. S. loses as many as 460 million man-days yearly through accidents. That's enough time to supply an army of 200,000 with full fighting equipment.

Remind your employees to play it safe *all the time*—on the job or away from it. Casualties on the home front are just as damaging as on the fighting fronts. For more data, write National Safety Council's *War Production Fund to Conserve Manpower,* William A. Irvin, National Chairman, Chrysler Bldg., New York City.

THE problem is simple to state. The nation's supply of essential materials must be made to go farther —particularly the vital alloy steels. More must be done with less.

Nosing out the scrap—the idle or dormant metal—is highly necessary, but it's only half the answer. The other half lies in using *new* alloy steels more efficiently—checking machine set-ups and plant procedures to reduce rejects, spoilage and undue scrap—using lower alloys wherever possible—plugging every loophole of waste.

Scrap the old steel, conserve the new; that's the only way the nation can secure a greater yield of war equipment for every ton of alloy materials taken off the national stockpiles. Let us help you *save!*

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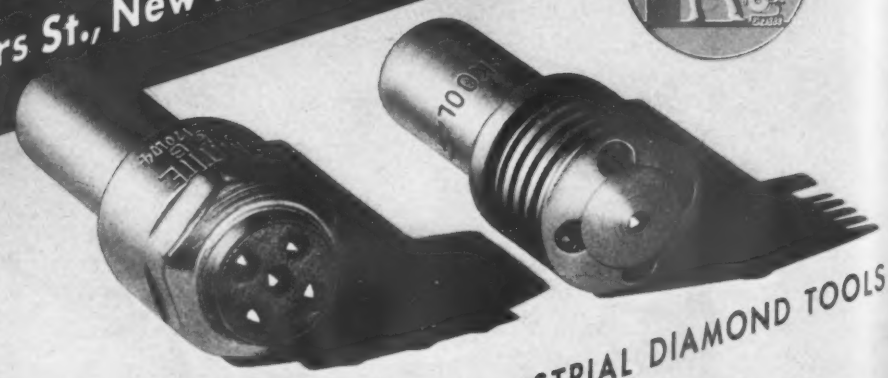

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Back held in position by	4 large screws
Center of spindle to center of hole in lug	.15/16"
Weight	8 ounces
Stem	.9/32 diam.
Dial	0-5-0 or 0-10
Graduated	.0001
Crystal	Non-breakable

Model C-10

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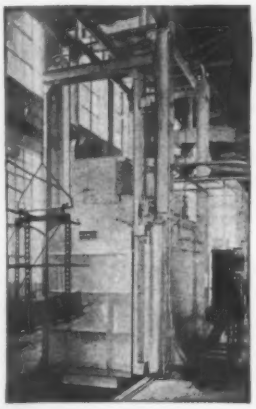


Box Cyclone of the type used by all leading aircraft manufacturers for aluminum and magnesium.

HEATING UNIFORMITY

because the surface of each piece of the load is bathed in an accurately heated stream of air, driven at high velocities through the work chamber by a large, powerful, dynamically balanced fan. The heat source is isolated from the work, thus eliminating any danger of overheating caused by radiant or "one-sided" heat.

HEATING ACCURACY

because the Lindberg Control (Bulletin 42) automatically measures the input of heat to meet the demands of the load. This is especially important when heat treating the nonferrous metals where long soaking periods are required. As the load becomes saturated, its heat requirements diminish and the Lindberg Control automatically supplies only enough heat to offset the small radiation loss. Control accuracy is such that solution heat treatment and ageing are handled in the same furnace.

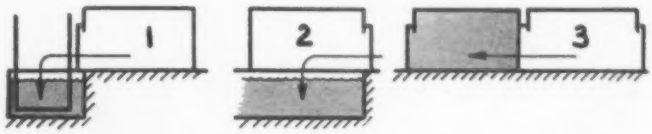
CONSTRUCTION ADVANTAGES

In addition to these heating and control features, the Cyclone is designed for long production life, safety of operation and easy access to all working parts for maintenance or replacement:

1. Heating elements and fan units are located so as to be easily accessible for maintenance or repair. Heating elements are designed for convenient removal for repair without cooling the furnace down.
2. Circulating fans are large volume type, dynamically balanced.
3. Fan is driven by motor of standard make which is replaceable by any other motor with the same nameplate rating.
4. Fan bearings are air cooled and mounted away from the furnace shell.
5. Zone heating is precision controlled to ±2.5° F. in even the largest furnaces.
6. Air operated, vertical lift doors with graphited asbestos gaskets prevent heat and air leakage.
7. The Cyclone's 50 different electric box type sizes and 22 sizes of gas fired units gives you a wide range of selection in setting up your production schedule.

QUENCHING

Cyclone furnaces are available, complete with tanks, for different methods of quenching, depending on the work being handled and the speed of quench desired:



1. Elevator quench (for castings)—rack is rolled out of furnace onto elevator which lowers work into quench.
2. Bottom quench (for stampings)—work is held in furnace heat until the bottom is moved out, then quickly lowered into quench directly below.
3. Fog quench (for stampings)—quench chamber is connected to end of furnace and houses a forced, fine spray of water into which work is drawn for quenching.

Write today for the NEW bulletin on Lindberg Furnaces for Aluminum and Magnesium Heat Treatment. Bulletin No. 140.

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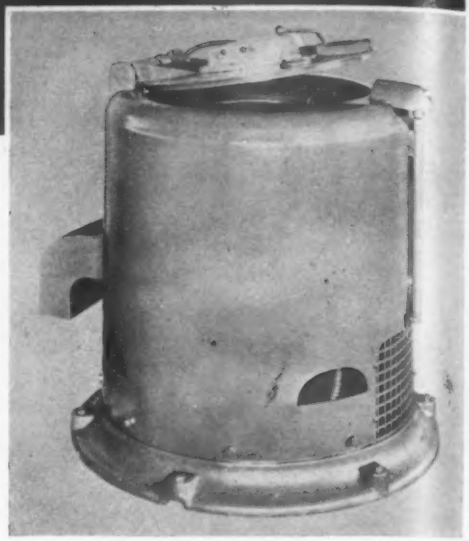
As in all Barrett Centrifugal machines, provision is made for convenience and safety of operation.

Send at once for details of Barrett Typhoon Washer



Barrett Centrifugal Washer — made in capacities from 13 to 38 cu. ft. per hour. Each size, depending on condition, will perform at the rate of 20 duty cycles per hour.

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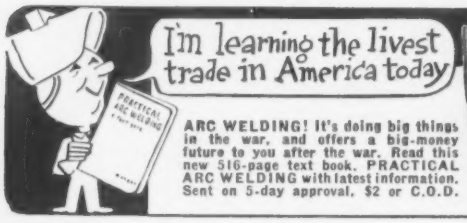

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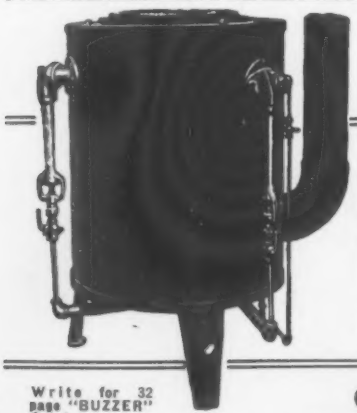

BUZZER

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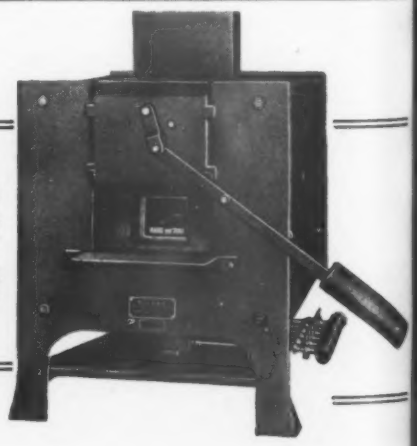

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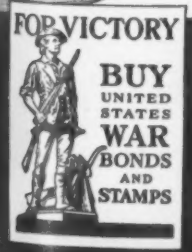

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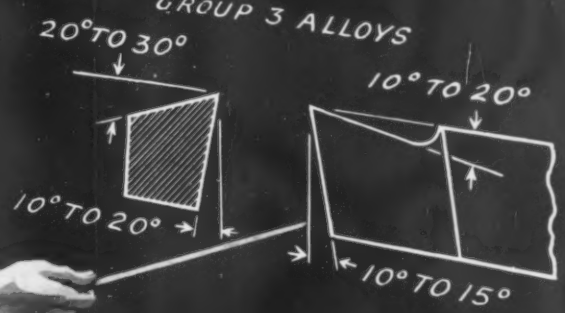
The ABC of machining Copper Brass & Bronze



Through specialization and long experience, many users of copper alloys have learned the correct tooling and machining characteristics of the particular alloys they use. However, a large number of metal working shops are now engaged in the manufacture of new products with new materials—have turned to the use of copper, brass or bronze—and are faced with the problems of determining the most effective cutting speeds, feeds and tool design. To assist these plants by providing helpful suggestions, The American Brass Company has made available a new publication, "Machining Copper and Copper Base Alloys." If your manufacturing operations include turning, drilling, tapping, threading or milling any of the copper base alloys, you'll find this booklet decidedly helpful.

THE AMERICAN BRASS COMPANY

General Offices: Waterbury, Connecticut

A ready-reference manual...Illustrated and condensed for your convenience

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from mine to consumer

Anaconda Copper & Copper Alloys

If you are machining any of THESE Copper Alloys . . .

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Red Brass 80%—32
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Muntz Metal—66

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Leaded Red Brass 80%—205
Leaded Brass—211
Butt Brass—229
Free Cutting Yellow Brass—271
Forging Brass—250
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*Tobin Bronze
Manganese Bronze—937
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Here is a new Anaconda Publication suggesting cutting speeds, feeds, tool rakes and clearances to be used on more than 40 copper alloys—from free cutting yellow brass all the way to copper and the tough bronzes. It is based on the use of standard cutting tool materials and contains many helpful, useful and practical suggestions on turning and cutting-off tools; form tools; drills, reamers and taps; thread chasers, milling cutters and coolants. Production engineers, tool setters and machine operators will find a copy both interesting and useful.

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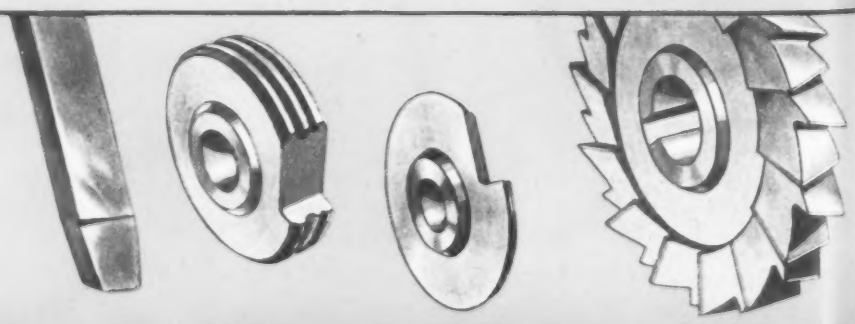

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Anaconda Copper & Copper Alloys

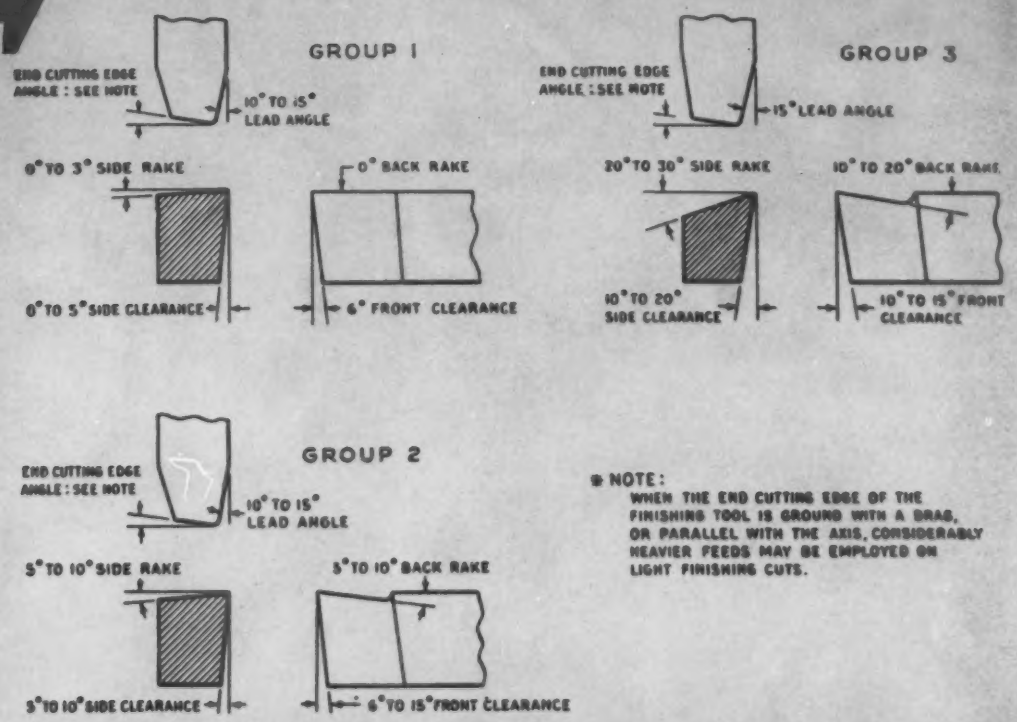
THREE REASONS WHY you should use the right speeds, feeds and cutting tool angles:

1 To save valuable time and scarce materials

2 To produce finer finishes and closer tolerances

3 To get top production out of your present equipment

LATHE TURNING TOOLS


GROUP 1
END CUTTING EDGE ANGLE : SEE NOTE
10° TO 15° LEAD ANGLE
0° TO 3° SIDE RAKE
0° BACK RAKE
0° TO 5° SIDE CLEARANCE
6° FRONT CLEARANCE
GROUP 3
END CUTTING EDGE ANGLE : SEE NOTE
15° LEAD ANGLE
20° TO 30° SIDE RAKE
10° TO 20° BACK RAKE
10° TO 20° SIDE CLEARANCE
10° TO 15° FRONT CLEARANCE
GROUP 2
END CUTTING EDGE ANGLE : SEE NOTE
10° TO 15° LEAD ANGLE
5° TO 10° SIDE RAKE
5° TO 10° BACK RAKE
5° TO 10° SIDE CLEARANCE
6° TO 15° FRONT CLEARANCE

* NOTE:
WHEN THE END CUTTING EDGE OF THE FINISHING TOOL IS GROUND WITH A DRAG, OR PARALLEL WITH THE AXIS, CONSIDERABLY HEAVIER FEEDS MAY BE EMPLOYED ON LIGHT FINISHING CUTS.

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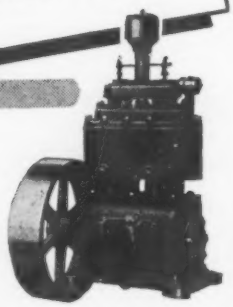

● It will pay you to follow these suggestions on proper servicing of your Curtis Compressor. While long life is an inherent quality of every Curtis product, a little extra maintenance care now will extend its years of usefulness to help carry through today's critical times.

INSTALLATION . . . Be sure your compressor is in a clean, dry location in a level position; mounted solidly on a concrete foundation or bolted to an iron base. If motor driven, see that compressor and motor operate at recommended speed, in proper direction, and that motor specifications agree with current available.

LUBRICATION . . . Maintain proper oil level—check daily—oil only through oil filler cap—follow manufacturer's instructions. Use light grade auto cylinder oil. Drain and refill every three months. Keep oil off of belts.

COOLING WATER . . . Circulate a continuous supply of cooling water through jackets—either by connection to water lines or with water circulating pump. Under full load, cooling water should not exceed 125° F. When pump is used, keep pump suction always flooded.

SERVICING . . . Drain moisture from air tank at least weekly, preferably every day. When replacing head gasket, secure proper grade of material from manufacturer—do not use paper or soft rubber. Keep compressor clean.

TESTING . . . If air supply or pressure decreases, test all outlets, joints, and valves for leaks—using soapy water and brush. Periodically inspect check valves, safety valves, and valves in head of compressor. If they leak, remove and clean—oil them so as to work freely. Keep flywheel tight on shaft with nut and lock washer.

GENERAL . . . Discharge piping should be full size of compressor opening, as short as possible, with minimum number of bends. Don't use steam or water check valves; use dash pot or disc type. We recommend "V" belt drives with take-up provision. Consult instruction book when making repairs or replacements—when ordering parts or repairs, give serial number on nameplate.

By following these few service suggestions, you'll aid your Curtis Air Compressor to operate at peak performance throughout an unusually long, trouble-free life.

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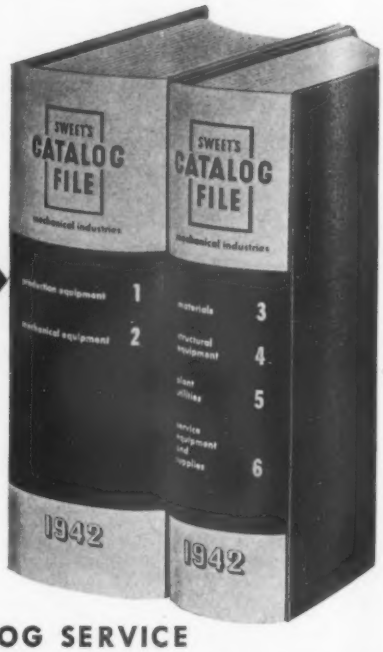
Turn to PRODUCTION EQUIPMENT Section 1



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ALTER EGO: Right! We've got to hack through plenty of uncharted wilderness that seems impassable . . . with little time on our hands . . . and come out with *better products* and *lower costs* than the other fellow. *Will-power* and *ingenuity* will build *this* "glory road".

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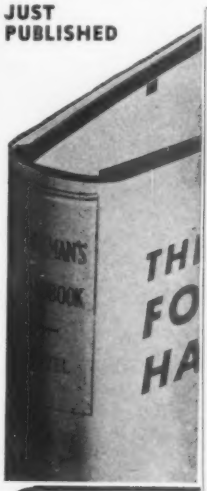

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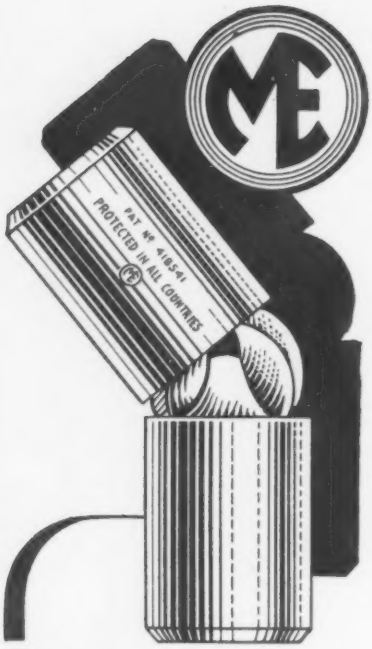

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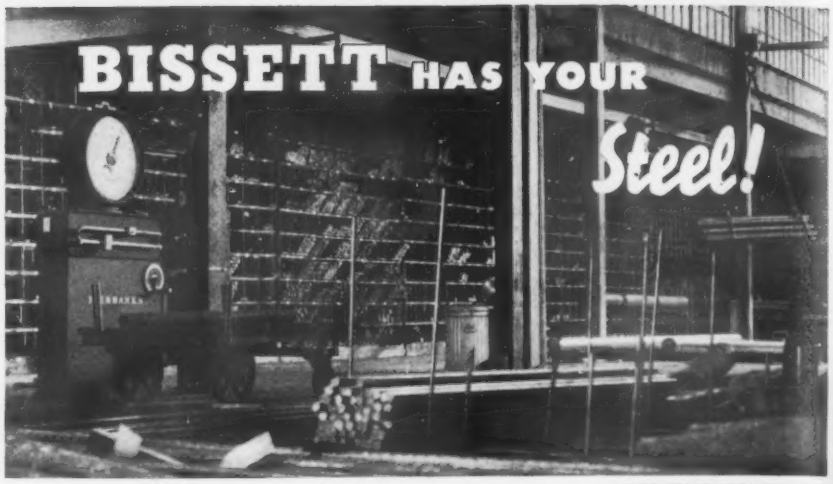

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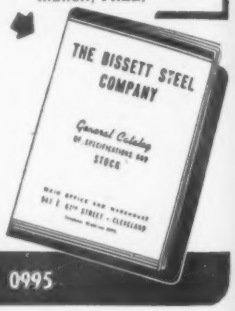

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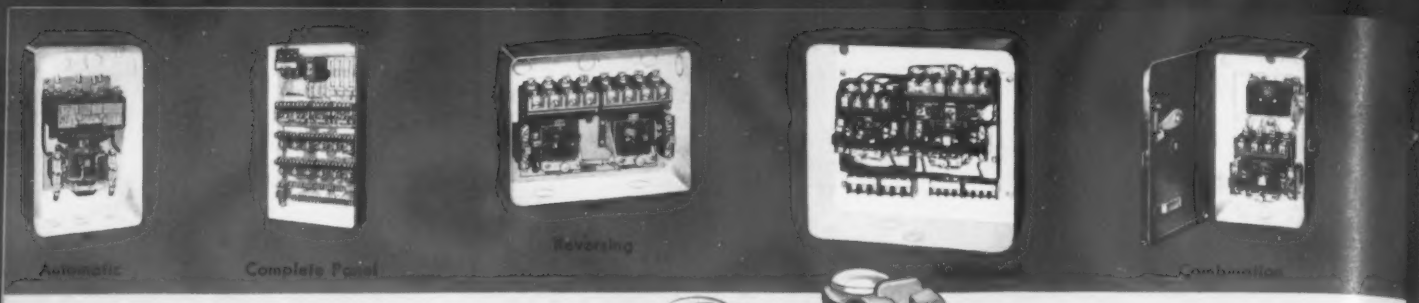

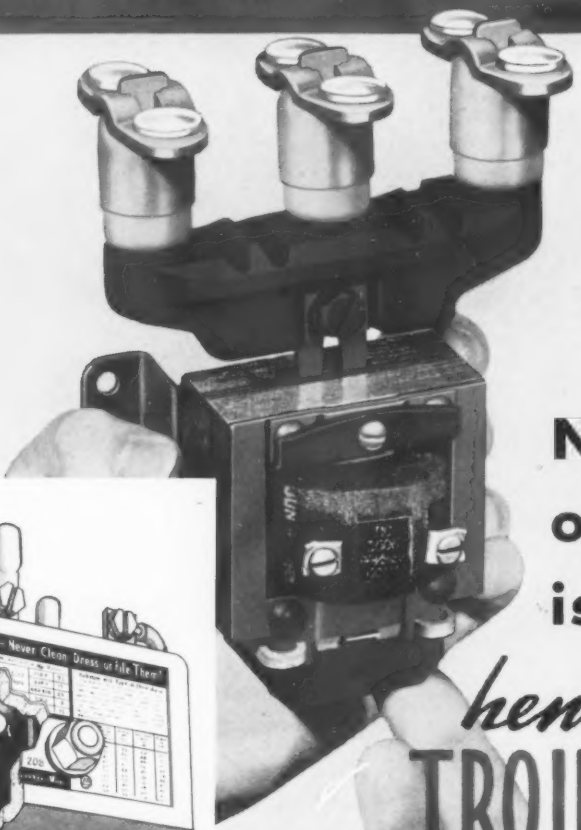

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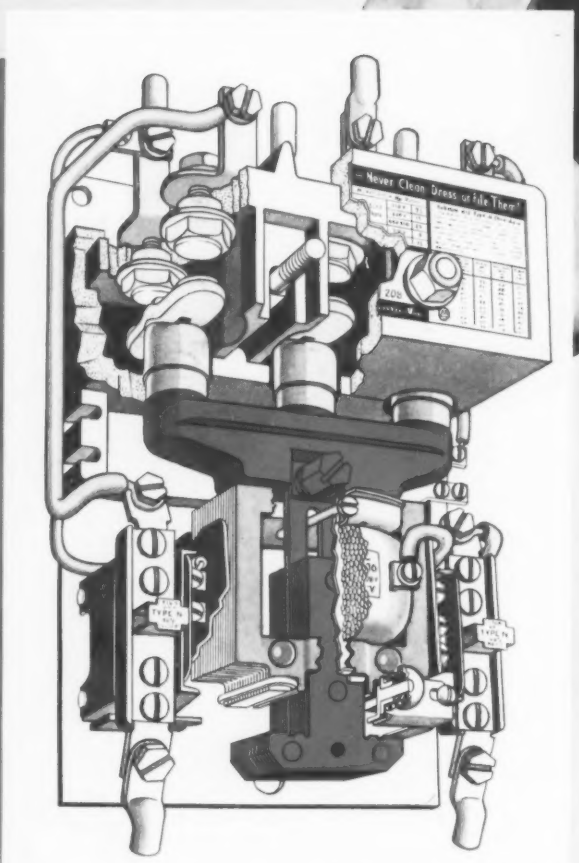

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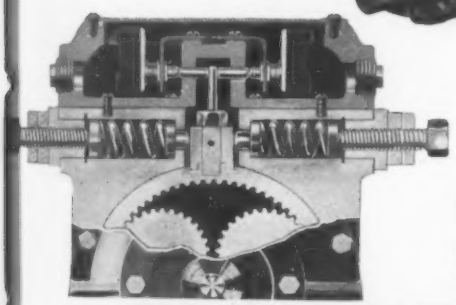

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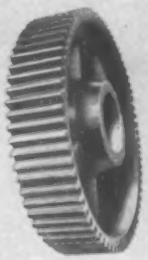

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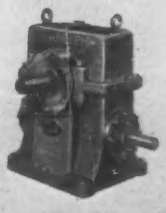

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